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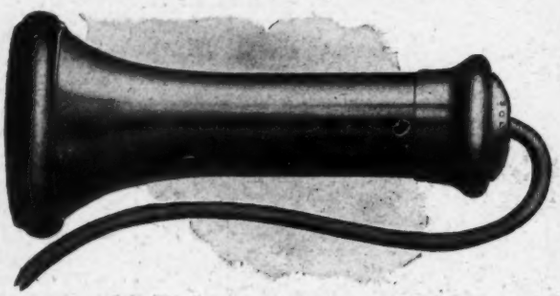

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Alphabetical Index to Advertisers

Acme Electric Co. 18
Advance Electric Co. 50
American Conduit Co. 98
American Electric Fuse Co. 16-17
American Elec. Tele. Co. 27-100
American Electric Works. 100
Andrae Sons Co., The Julius. 36
Austin, M. B. & Co. 1
Automatic Electric Company. 9

Baird Mfg. Co. 34
Barrarm 34
Beidler & Co., Francis. 95
Benedict & Barnham B. & C. Co. 97
B. R. Elec. & Telo. Mfg. Co. 99
Big 4 R. R. 98
Bissell Co., F. 48
Bowersock, Fred H. 50
Brooks, Hall L. 90
Butterfield, J. F. 100

Camp Co., H. B. 98
Carney Bros. Co. 89
Central Telo. & Electric Co. 18
Chicago Fuse Wire & Manufacturing Co. 8
Chicago Telo. Supply Co. 1-3-5
Chicago Insulated Wire Co. 100
Chicago Writing Machine Co. 12
Clark Wireless T.-T. Co., Thos. E. 20
Commercial Elec. Supply Co. 26
Conover, Geo. W. 100
Controller Co. of America. 11
Cook, F. B. 29
Coolidge Co., Marshall H. 87
Crowe Metal Mfg. Co. 1
Crumb & Co., W. H. 100

Dearborn Electric Co. 1
Deavitt, H. M. 1
Doubleday-Hill Electric Co. 20

Electric Appliance Co. 6
Electrical Supply Co. 36
Eureka Electric Co. 35-50
Ewing-Merkle Electric Co. 12

Fahnestock Transmitter Co. 20
Faller Automatic Tel. Ex. Co. 85
Farr Telephone & Construction Supply Co. 10
Field, C. J. 2
Fowler, John H. 95

Garton-Daniels Company. 1
General Engineering Co. 1
Greenbrier Pole Co. 94
Guarantee Telo. & Equipment Co. 36

Hallett Iron Works 8
Harvard Electric Co. 50
Helios-Upton Co., Receivers. 12
Hemingray Glass Co. 14
Holt Lumber Co. 88
Hopkins & Co., A. P. 92
Hubbs-Neer Elec. Co. 100
Huebel Co., C. J. 92

Illinois Electric Co. 28
Imperial Finance & Const. Co. 100
Indiana Rubber & Ins. Wire Co. 2
Indiana Steel & Wire Co. 48
International Creosoting & Construction Co. 97
International Telephone Manufacturing Co. 25

Jones & Winter 1

Kellogg Switchboard & Supply Co. 32-33-93
Kester Electric Mfg. Co. 50
Keystone Elec. Telephone Co. 100
Klein & Sons, Mathias. 1
Klipstein & Co., A. 100
Kokomo Telo. & Elec. Mfg. Co. 4

Lindsley Bros. Co. 95

Maltby Lumber Co. 93
Matthews & Bro., W. N. 97
McOuat, Robt. L. 99
McRoy Clay Works 1
Middleton & Co., J. W. 100
Miller Anchor Co. 22
Monarch Telephone Mfg. Co. 21
Moon Manufacturing Co. 14
Mountain State Electrical Co. 30
Mueller Company, Wm. 86
Murdock & Co., W. J. 2

Nagel Elec. Co., W. G. 1-23
Nash & Co., Geo. 2
National-Acme Mfg. Co. 26
Naugle Tie Co., E. E. 90
New Haven Novelty Machine Co. 30
N. Y. Insulated Wire Co. 1
North Electric Co. 7
Norstrom Lock-out Telo. Mfg. Co. 24

Okonite Co., Ltd., The. 97

Pendleton & Gilkey 94
Perrizo & Son. 91
Pittsburg & Lake Superior Iron Co. 87
Plew & Motter 43
Plume & Atwood 99
Pontiac Engraving Co. 98

Raber & Watson 33
Roebling & Sons Co., John A. 96
Rogers, Oscar Wentworth. 38-39-40-41-42-43-44-45-46-47

Sand Point Cedar Co. 91
Scoville Manufacturing Co. 99
Spies Electric Co. 50
Standard Telo. & Electric Co. 23
Standard Underg'd Cable Co. 50
Stanton, L. W. 100
Sterling Electric Co. 49
Stevens Co., Charles G. 1
Stromberg - Carlson Telephone Manufacturing Co. 37
Swedish-American Tele. Co. 21

Taylor, Lee J. 96
Telephone Books 96

Veeder Mfg. Co. 30
Victor Telephone Works. 100
Vought-Berger Co. 15

Want Advertisements 96
Warner Electric Co. 24
Waterbury & Co. 99
Wesco Supply Co. 50
West Disinfecting Co. 12
Western Telephone Mfg. Co. 89
White Pine Lumber Co. 59
Williams-Abbott Elec. Co. 10
Worcester Co., C. H. 86

Yesbera Mfg. Co. 34
Yonkers Specialty Company. 22

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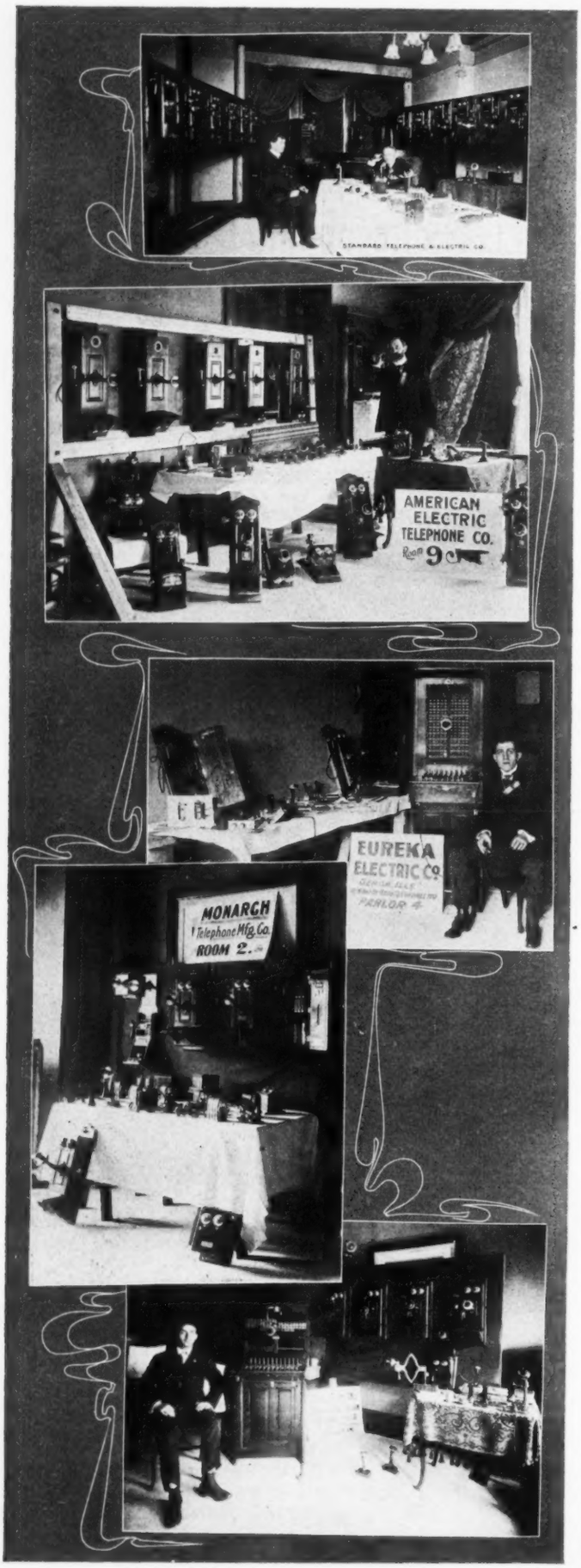
Wisconsin Independent Convention

The meeting of the fifth annual convention of the Independent Telephone Association of Wisconsin, held in Milwaukee February 10 and 11, 1904, was called to order by the president in the convention hall of the Pfister Hotel at 2 o'clock.

The president, Richard Valentine of Janesville, delivered his annual address, showing the continued rapid progress being made by the Independent companies throughout the state. He declared that all the companies had greatly increased their lists of subscribers and that a new exchange had just been finished in the city of Kenosha and the construction of an exchange was being contemplated in some of the other important cities in the state. Many miles of toll lines were built during the year, including considerable copper-line construction, and the prospects for additional copper lines being constructed the present year were very good. The Independent exchange now being built in Chicago, he believed, gave assurance that most of the sections of Wisconsin would have long-distance service to that city before the end of this year.

He spoke at length in regard to the telephone legislation that the association had endeavored to secure at the last session of the legislature, and particularly upon the bill prohibiting discrimination in telephone rates which, by dint of hard work, had been carried by the house by a vote of three to one, but which was finally lost in the senate by only one vote. His impression was that if the Independent companies of the state had been a little more active the passage of this important measure would have been easily assured. He urged that the members interest themselves in the nomination and election of their representatives and that they should all co-operate to help secure this legislation at the next session. By the end of this year most of the sections of the state would have long-distance service to the wholesale cities of Duluth, Superior, St. Paul, Minneapolis and Dubuque on the north and west and to Sheboygan, Racine,

THE WISCONSIN INDEPENDENT TELEPHONE CONVENTION—GROUP OF DELEGATES AND VISITORS.



EXHIBITS AT THE WISCONSIN CONVENTION.

Kenosha and Chicago on the east, and if the business men of Milwaukee realized how extensive the Independent telephone business had become in this state and were alert to their interests, they would demand the granting of an Independent franchise, for the very good reason that it will be only a matter of a short time before Milwaukee will be made to realize that as long as it only has the Bell exchange as connection a great deal of business that would naturally come to the metropolis of the state will be diverted to those other cities.

J. C. Harper, president of the Dane County Telephone Company, Madison, then read a paper on "Legislative Prohibition of Discrimination in Telephone Rates," which follows:

At the convention of the Wisconsin Independent Telephone Association held in Milwaukee in February, 1903, a committee was appointed for the purpose of considering the question of legislation. That committee was composed of Richard Valentine, president of the association; A. B. Ferdinand of Milwaukee, James Kavenaugh of Kenosha, A. W. Larson of McFarland, A. L. Hutchinson of Weyauwega, and myself. In view of the fact that the legislature was then in session it was necessary to give immediate consideration to any legislation that might be deemed advisable; and accordingly a bill known as 603 A was introduced into the assembly by John Donald, February 13, 1903. This bill is probably familiar to many of the members of this convention, however, if I should judge from the lack of interest shown in its passage on the part of many Independent telphone people I would say that it was, and probably is not now, as well understood as it should be; and in view of the fact that it is legislation that will be asked for at the next session of our legislature and that all Independent interests should be interested in its passage, it seems to me to be one of the important topics to be considered.

It is a well known fact that the Bell Telephone Company has invariably looked after legislation, both in the state legislatures and congress, and that prior to the advent of Independent telephones, had things pretty much its own way; urging the passage of measures beneficial, and bitterly fighting those it did not desire to have passed. This is true of all trust concerns.

Bill 603 A provides that a telephone company owning exchanges in two or more cities of the same class shall charge its subscribers the same price for like service and prohibits a telephone company from compelling its subscribers in a city where it has no competition to pay the telephone rental of its subscribers where it has competition so that taking the two cities together it obtains a sufficient amount in one, over and above a legitimate profit, to enable it to furnish free service in the other and still make a profit. In other words, the present scheme followed out in this state by the Bell company is to compel citizens of one city to assist it in driving out competition in another. As an illustration, the Bell company is compelling the citizens of Oshkosh to assist it in driving out competition in Racine and La Crosse; also the Bell company is compelling the citizens of Green Bay, Eau Claire, Marinette and Fond du Lac to assist it in driving out competition in Madison and Appleton; also the Bell company is compelling the citizens of a number of other cities in this state, where it has no competition, to assist it in giving free service in other cities of the same class where it has competition.

Had this bill been passed by our last legislature the Bell company, under the law, would be compelled to charge the citizens of Oshkosh, Racine and La Crosse the same price for like telephone service; in other words, it would not be permitted to charge from $4.00 to $6.00 a month to a business place in Oshkosh, where it had no competition, and charge $1.00 a month, or nothing, to a business place in La Crosse for identically the same service, where it had competition. Therefore a subscriber for a telephone in Oshkosh is paying the telephone rental for somebody in La Crosse. The Bell company has, undoubtedly, taken as an example the schemes followed out by the Standard Oil Company. Most of you can, undoubtedly, remember when the Standard Oil Company was perfecting its trust, it charged the citizens of one city from ten to fifteen cents a gallon for oil, while in another city, probably not fifty miles distant, where it had competition, it was selling oil from three to five cents a gallon.

If this bill had passed, the Bell company would be compelled to give free service in the city of Green Bay in the event that it continued to give free service in the city of Madison as it has been doing, these two cities being in the same class; or if it desired to maintain its present rates in Green Bay it would be compelled to raise its rates in Madison to equal those charged in Green Bay. The failure of the Michigan Bell Telephone Company was caused by the large development of the Independent interests in that state and the loss it suffered in endeavoring to retain its subscribers by furnishing, virtually, free service. If there were Independent exchanges in every city in this state and the Bell company followed out the same plan it now does in cities where there are Independent

exchanges it would only be a short time before it would fail in this state.

At once upon the introduction of bill 603 A in the assembly, the firm of Sanborn & Sanborn were employed as lobbyists against it. They registered as lobbyists for the Great Western Telephone Company. You will recall that the Great Western Telephone Company applied for a franchise in this city shortly after a legitimate Independent franchise was applied for by the citizens of Milwaukee and others. It has been one of the customs of the Bell company to undertake the defeat of a legitimate franchise, by having some stool pigeon introduce another franchise containing more favorable terms to the city, for the purpose of defeating the franchise honestly applied for; consequently, the Great Western is a fake company, incorporated by people friendly to the Bell interests to be made use of whenever it can; therefore, the lobbyists were registered for the Great Western Telephone Company.

The statement was frequently made by lobbyists opposing the bill that the Great Western Telephone Company had a half million dollars to expend for telephone construction in this state, providing the bill was not passed. At the time these lobbyists registered, the Great Western Telephone Company, under that name, did not own a telephone or line of any character in the state of Wisconsin; and up to the present time, so far as I know, has not spent a dollar in construction.

When the Bell company found that it was unable to defeat the bill in the assembly and realizing that it was necessary to increase its force of lobby hirelings, it secured the services of E. Ray Stevens of Madison, a former assemblyman. He also registered as a lobbyist for the Great Western Telephone Company. There were several hearings before the assembly committee and all the tactics commonly used to defeat a bill were resorted to; however, when we got it to a vote it was passed by a large majority. The bill was then sent over to the senate and through the scheme of its opponents the bill was referred to the committee on corporations, of which Senator Green was chairman; it being well known that the chairman as well as a majority of the committee were friendly to trust interests and kindly disposed towards the Bell company. The conduct of this committee clearly indicated that it intended, if possible, to keep the bill from being brought to a vote in the senate by refusing to report it to that body to be acted upon. After resorting to all the disreputable tactics possible, the opponents of the bill, assisted by W. H. Austin and E. L. Phillips of Milwaukee, were forced to permit the bill to come before the senate to be voted upon May 19, 1903, at which time it was defeated by two votes as shown in the senate journal of that date.

The president and secretary of this association, Mr. Ferdinand, Mr. Cavanough, Mr. Larson, myself and a number of others worked hard to familiarize the members of the legislature with the different features of the bill and to obtain its passage; but as you all know it was a difficult matter to pass the bill through the senate of the last legislature that contained a particle of anti-trust legislation.

I go into the matter of trying to pass this bill for the purpose of showing you that if we expect this bill or any similar one to be enacted into law we must not stand idly by and permit men to be elected to our legislature who can be controlled by the Bell company.

I contend that bill 603 A is a perfectly fair and just bill to be enacted into law and that where a corporation has been granted the right by this state to do business herein, that it should treat the citizens thereof alike as nearly as possible. That it should not, because it is offered the opportunity, force the citizens of one locality to assist it in ruining the business enterprises of citizens in another part of the same state; but this is just what the Bell company is now doing and will continue to do until it is compelled by law to be reasonably just.

I regret to say that it was the feeling of us who spent so much time and work in trying to pass this bill that many of the Independent people of this state did not assist as they should have done, but I sincerely hope that between now and the termination of the next session of our legislature, they will make up for the laxity heretofore shown.

Mr. Harper's paper was commented upon at length by A. B. Ferdinand, who spoke of his work with the legislature in regard to the proposed law and pointed out the many beneficial features therein and called attention to the fact that if there was any one man who was to be thanked for the defeat of the bill, and who labored and lobbied incessantly against it, it was Senator J. H. Green of Milwaukee, proprietor of the Green Telephone & Electric Company of that city. In view of the fact of his alliance with the Bell company, he moved that the Green Telephone & Elctric Company, being a member of the association, should be suspended therefrom, which motion was carried.

W. F. Goodrich of the La Crosse Telephone Company spoke in regard to the order issued by the Postmaster General by which Independent telephones were to be removed from the various postoffices and substituted by Bell instru-

EXHIBITS AT THE WISCONSIN CONVENTION.

ments. The postmaster at La Crosse had received this order as well as those of many other cities; and in the cities of St. Paul and Minneapolis, where the Independent companies have connection with elaborate interior systems in the postoffice buildings, such companies had been notified to remove such systems and that they were to be substituted by similar systems to be installed by and connected with the Bell company and that this order had been carried out.

J. C. Harper further discussed this order of the Postmaster General, stating that upon inquiry at the Madison postoffice, there had never been a long-distance communication by telephone to or from Washington, showing that there was no necessity for such long-distance connection with the Washington Postal Department. It was simply a scheme of the Bell company to gain an advantage over the Independent companies. The Postmaster General, H. C. Payne, was formerly a director and lobbyist of the Wisconsin Bell Telephone Company and very active in its behalf, and no doubt felt kindly disposed towards the Bell company.

A. B. Ferdinand urged the appointment of a committee to draft a set of resolutions concerning the order of the Postmaster General and the following were appointed: Messrs. W. F. Goodrich, A. B. Ferdinand, and C. W. Twining.

As a difference had arisen between the Badger State Telephone & Telegraph Company and other companies operating in the same territory, A. B. Ferdinand advised the appointment of a committee to call upon the officers of the Badger company and ascertain its policy in regard to competing with other Independent companies and the motion being carried the following committee was appointed: Messrs. A. B. Ferdinand, J. C. Murdoch and J. E. Keelyn.

The committee on general resolutions was appointed as follows: A. L. Hutchinson, W. H. Little and H. Teasdale.

On motion a committee of three was appointed to ascertain the plans of the Chicago Automatic Telephone Company in regard to connecting with the Independent toll lines of Wisconsin as follows: Messrs. A. B. Ferdinand, J. E. Keelyn, and Richard Valentine. Adjournment was then taken until 10:00 a. m. Thursday.

THURSDAY MORNING SESSION.

The meeting re-convened and G. W. Wilder, professor of telephony in the Armour Institute, Chicago, made an address on "Improvement in the Telephone Service." He made many valuable suggestions concerning the service in general, stating that prompt service is necessary and should not be sacrificed for the purpose of reducing operation expenses; the problem being to give the subscriber the best service possible and yet pay a fair return on the investment. He added that telephone men should keep themselves fully informed as to the latest apparatus and improvements and be up-to-date. Parties conducting a telephone business, no matter how small, should incorporate, as otherwise they are partners and personally liable for debts, damages, etc. Crosstalk was an evil hard to contend with, but should be kept at a minimum. Party lines, he said, if the parties thereon were properly grouped, give satisfactory service and they are more profitable than individual lines. The various lock-out systems have passed the experimental stage and are now being extensively used. Pay telephones, he urged, should be installed for the accommodation of the public and they are always found to be very profitable. Underground construction work has been much reduced in cost the last few years and is now being much more used than formerly and is sure to pay in the long run.

A. L. Hutchinson then presented the report of the committee on general resolutions, which was adopted as follows:

GENERAL RESOLUTIONS.

Whereas, The Independent telephone companies of Wisconsin have covered the state with a network of lines, which connect local exchanges whose subscribers outnumber those of the Bell company three to one, and

Whereas, The Independent toll lines will be connected with Chicago during the present year, and are now connected with the wholesale cities of Dubuque, St. Paul and Minneapolis, all of which does and will divert much business from the city of Milwaukee to those cities of adjacent states, therefore be it

Resolved, That the attention of the citizens and business men of Milwaukee be advised of this growing loss of business to the metropolis of our state to the end that encouragement and aid shall be furnished any attempt to establish a local exchange in the city of Milwaukee to connect with the Independent exchanges of the state, and be it further

Resolved, That a copy of this resolution be forwarded the press of the city of Milwaukee.

Whereas, Certain manufacturing and supply houses and certain telephone and electrical journals have done much good work in advertising this meeting of our association, therefore be it

Resolved, That the thanks of this association be extended to all who have contributed to the publicity of our association, and be it further

Resolved, That the thanks of the association be extended to our retiring officers for their faithful work in the cause of Independent telephony in the past.

Whereas, It is evident that certain persons unfriendly to Independent telephone interests have been in attendance upon the sessions of this convention, therefore be it

Resolved, That some rule or regulation be adopted so that only persons bringing credentials endorsed by the company represented and by the secretary of this association shall hereafter be admitted to the meetings of this or future conventions of the association.

W. J. Bell urged that the membership of the association should be increased and advised the appointment of a committee for securing new members which was appointed as follows: Messrs. W. J. Bell, H. E. Keppler and C. W. Twining.

B. E. Whittemore, a representative of the Green Telephone & Electric Company spoke in regard to the suspension of his company by the association from its membership, contending that such action was unfair and not deserved. A motion was made to rescind such suspension, which was discussed by Messrs. F. S. Veeder, J. E. Keelyn, H. Teasdale, Richard Valentine, W. J. Bell, O. G. Loomis and A. B. Ferdinand, but the motion was lost. W. F. Goodrich then presented the following resolution, which was adopted:

"*Resolved*, That a committee of five be appointed to whom shall be referred propositions for long-distance service between Wisconsin and any other state contemplating a contract for more than one year between members of this association and any other company; and further, that the secretary be directed to notify all the members of the association of this resolution, together with the names of such company, with the request that no contract for inter-state long-distance service be entered into until such committee has been notified of the general character of such contract and its approval thereto be had."

The following were appointed as such committee: Messrs. W. H. Little, A. L. Hutchinson, H. Teasdale, William Van Middlesworth and A. B. Ferdinand.

H. Durant, representing the Automatic Eelectric Company, Chicago, stated to the convention that his company was willing to connect for long-distance purposes with the Independent companies of Wisconsin who had good toll lines, and assured the members that all rumors to the contrary were without foundation.

J. E. Keelyn presented the following resolution of his committee, which were adopted:

"*Resolved*, That a committee of three be appointed to whom shall be referred all disputes, or question of differences arising between any two members of this association, or disputes between members of the association, and toll lines, or exchanges of non-members when such disputes or questions arise from the alleged preferred rights of connection with an exchange or toll line of such parties or either of them; such committee to have power to arbitrate such matter so far as possible."

The following were appointed such committee: Messrs. G. W. Wilder, F. S. Veeder and Charles Schernecker.

Adjournment was then taken until 2:00 p. m.

THURSDAY AFTERNOON SESSION.

W. F. Goodrich presented the resolutions of the committee in regard to the order of the Postmaster General as follows, which were adopted:

Whereas, An order has been issued by the Postoffice Department

restricting the use of telephones in postoffices to the one in connection with Washington, D. C., making it a necessity for postoffices to use only the Bell company's system, and

Whereas, This to the minds of the Independent telephone men appears to be an entirely unjust discrimination in favor of Bell company interests, by reason of the Postmaster General's connection with and sentiment toward that monopoly, thereby using an official position of the government to further interests detrimental to about two million and thirty thousand Independent telephone users as against one million two hundred and thirty thousand users of the Bell company telephones in the country, and

Whereas, The Independent companies, being also long distance companies, but without connection of Washington, D. C., it is evident the smaller Independent companies, many times outnumbering the Bell companies, would be seriously deprived in not having connection with the postoffices in their larger adjacent cities upon which they are dependent. Also that for the few calls for Washington, necessary to postmasters, it is unnecessary to retain the Bell connection solely for that purpose. Also for the use of department inspectors, Independent lines can furnish in most cases the same service as the Bell company and in many others the only connection for their use. Also Independent lines accommodating as many, if not more rural subscribers on rural mail routes than the Bell company, which in many instances are built and owned by the users for the purpose of postoffice and other connections, are particularly discriminated against, and

Whereas, The building of Independent toll lines and exchanges has resulted in nearly every case in lowering the expense of telephone service to the department, enabling it to use both the Bell company and Independent systems at the same expense as the former Bell company charged, therefore be it

Resolved, That the Wisconsin Telephone Association, in convention assembled, and representing 250 Independent companies with 35,000 subscribers in this state, does vigorously protest against the unjust discrimination practiced in this instance, and be it further

Resolved, That the secretary of this organization be instructed to

send copies of this resolution to Theodore Roosevelt, President of the United States, and to Henry C. Payne, Postmaster General, also to each member of this association, with instructions to personally send them to their United States senator and representative, together with written protests to them, also that the secretary of the association be instructed to take up the matter with other Independent telephone associations, that proper representation may be brought to bear on the Postmaster General to the end that the obnoxious order will be rescinded.

J. C. Harper advised the appointment of a committee of legislation which was appointed as follows: Messrs. J. C. Harper, A. L. Hutchinson, A. B. Ferdinand, M. D. Larson, Richard Valentine and James Cavanaugh.

The following companies made application for membership, and on motion were accepted:

F. Bissell Company, Toledo, Ohio; Cambridge Telephone Company, Cambridge; Columbia County Telephone Company, Morrisonville; Fulmer Lumber Company, Florence; Independent Consolidated Telephone Company, Weyauwega; Kingston Telephone Company, Kingston; Mazomanie Telephone Company, Mazomanie; Oxford & New Haven Telephone Company, Oxford; Signalphone Company, Milwaukee.

The secretary then read his annual report, which showed that the Independent telephone business in the state continued to grow rapidly and that the association now comprises sixty-four active and twenty-five associate members, embracing three-fourths of the Independent telephone interests of Wisconsin.

On motion, the following officers were elected for the ensuing year: Richard Valentine, Janesville, president; H. G. Slater, Waupaca, vice-president; H. C. Winter, Madison, secretary and treasurer, Members of the executive committee: C. W. Twining, Monroe; G. Huette, Sheboygan; J. C. Harper, Madison; W. F. Goodrich, La Crosse; Julius Thielman, Merrill; John M. Baer, Appleton; E. A. Miller, Hixton, and J. C. Crowley, West Superior.

It was moved and adopted that the next annual convention be held in the city of Milwaukee, February 9 and 10, 1905.

Convention adjourned.

LIST OF TELEPHONE COMPANIES REPRESENTED.

WISCONSIN.

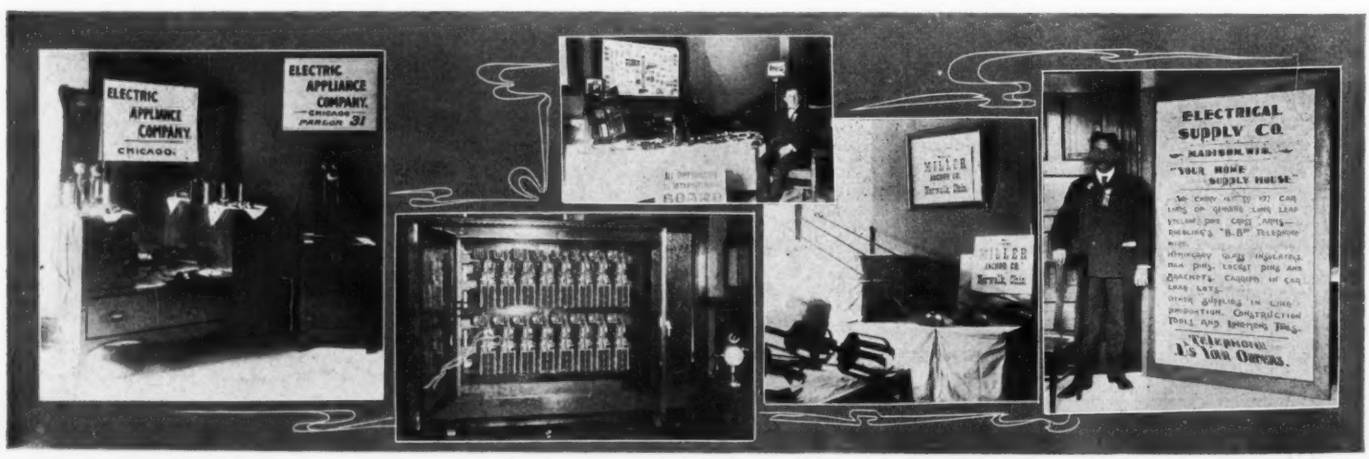
Badger State Telephone & Telegraph Co.....Neillsville
Badger Telephone & Telegraph Co.....Milwaukee
Belleville Telephone Co.....Belleville
Beloit Telephone Co.....Beloit
Brodhead Telephone Co.....Brodhead
Calumet Telephone Co.....Johnsburg
Cambridge Telephone Co.....Cambridge
Cedar Lake Telephone Co.....Schleisingerville
Central Wisconsin Telephone Co.....Hixton
Central Wisconsin Telephone Co.....Portage
Citizens' Telephone Co.....Racine
Citizens' Telephone & Telegraph Co.....Kenosha
Citizens' Telephone Co.....Sheboygan
Columbia County Telephone Co.....Morrisonville
Dane County Telephone Co.....Madison
Dane County Rural Telephone Co.....Madison
East Valley Telephone Co.....New Prospect
Eastern Wisconsin Telephone Co.....Kiel
Edgerton Telephone Co.....Edgerton
Fox River Valley Telephone Co.....Appleton
Friendship Telephone Co.....Friendship
Independent Consolidated Telephone Co.....Appleton
Interurban Telephone Co.....Sun Prairie
Juneau Electric Co.....Mauston
Kingston Telephone Co.....Kingston
La Crosse Telephone Co.....La Crosse
Monroe Telephone Co.....Monroe
Monroe County Telephone Co.....Sparta
Orfordville Telephone Co.....Orfordville
Oxford & New Haven Telephone Co.....Oxford
People's Telephone Co.....Rio
Pewaukee & Sussex Telephone Co.....Pewaukee
Plymouth Telephone Co.....Plymouth
Portage Telephone Co.....Portage
Rock County Telephone Co.....Janesville
Rock County Farmers' Telephone Co.....Janesville
Stoughton Independent Telephone Co.....Stoughton
Two Rivers Telephone Co.....Two Rivers
United Telephone Co.....Monroe
Waupaca Citizens' Telephone Co.....Waupaca
Winnebago County Telephone Co.....Milwaukee

ATTENDING DELEGATES.

W. L. Smith, E. Sipperly, H. J. Ulrich, S. E. Miller, J. C. Murdoch, O. C. Schulz, Walter Bliss, J. J. Schoofs, G. W. Wilder, John Rosenheimer, E. A. Miller, W. A. Marr, J. S. Jones, Wm. Van Middlesworth, A. T. Gille, J. E. Keelyn, G. Huette, W. R. Chipmen, J. C. Harper, H. C. Winter, Hiram Nelson, E. D. Brith, L. H. Schram, A. A. Paulson, F. W. McKinney, P. C. Brown, T. B. Earle, W. A. Shelley, Wm. McIntosh, F. T. Green, E. E. Smith, A. L. Hutchinson, John Kidd, O. Morrison, Wm. Reuther, Geo. Morrison, Chas. Shernecker, B. J. Anderson, G. H. Beazam, F. S. Veeder, O. G. Loomis, I. C. Baldwin, W. R. Simms, E. J. Joslen, O. W. Joslen, W. F. Goodrich, E. A. Croll, W. P. Bragg, C. W. Twining, H. Teasdale, C. M. Beebe, W. G. Loomis, F. A. Cole, W. J. Bell, J. L. Farrington, Alex. Caldwell, L. H. Schren, E. H. Warner, W. H. Little, T. H. Runkel, Richard Valentine, H. C. Willitz, Richard Valentine, E. Sipperly, C. F. Kirst, C. W. Twining, P. J. Weirich, C. W. Forbes, H. G. Slater, R. J. Havenor, A. B. Ferdinand.

LIST OF EXHIBITORS.

Chicago Writing Machine Company, Chicago, F. W. Pardee; American Electric Tel. Co., Chicago, G. P. Gerst, Wm. Herron; J. Andrae & Sons Co., Milwaukee, Herman Andrae, J. C. Schmidtbauer, A. E. Stadelbauer; Automatic Electric Co., Chicago, H. S. Durant, A. J. Rousseau; F. Bissell Co., Toledo, M. S. Walker; Central Electric Co., Chicago, W. W. Gisse, J. W. Mason; Electric Appliance Co., Chicago, S. A. Dinsmore, J. B. McMullen; Electric Supply Co., Madison, Wis., L. W. Burch; Elliott Addressing Machine Co., Chicago, R. St. John; Eureka Electric Co., Genoa, Ill., Herbert Rosenow; Fulmer-Kuester-Schroeder, Chicago, D. M. Fulmer; Green Tel. & Electric Co., F. J. Whittemore; Holtzer-Cabot Electric Co., E. R. Harding; Illinois Electric Co., C. W. Bacon; International Telephone Mfg. Co., H. H. Davenport, D. F. Diamond; Kellogg Switchboard & Supply Co., Chicago, F. E. Rotchka, W. B. Hind; Miller Anchor Co., Norwalk, Ohio, G. H. Miller; Monarch Telephone Mfg. Co., Chicago, E. E. Yaxley, W. H. Trimm; Norstrom Lockout Telephone Mfg. Co., Chicago, Wm. Herron; J. A. Roebling's Sons Co., Trenton, N. J., and Chicago, W. H. Slingluff, Bond Wisler; Signalphone Co., Milwaukee, A. D. Weller, H. F. Butler; Standard Tel. & Electric Co., Madison, Wis., J. H. Parish, W. A. Taylor; Sterling Electric Co., Lafayette, Ind., W. E. Doolittle; Stromberg-Carlson Telephone Mfg. Co., Chicago, Don C. Gould, H. A. Jones; Vought-Berger Co., La Crosse, Wis., M. I. Berger, D. W. Campbell, A. Meinema; Telephony Publishing Co., Chicago, H. B. McMeal, E. E. Smith.



Transposition of Telephone Lines

FRANK F. FOWLE, S. B.

I.—Introduction on the nature and the properties of transmission lines and formula for inductance and capacity of single lines.

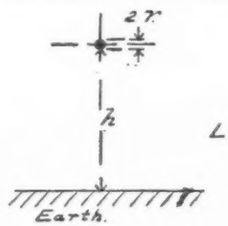
I have the honor to present, by request, a paper on the transposition of telephone lines with reference to the treatment of cross-talk and foreign induction. The theory of transpositions will best be introduced by a consideration of the elementary theory and the nature of transmission lines.

A transmission line is characterized by its electrical properties, of which there are four, to completely determine its action. These four properties are termed resistance, leakage, inductance and capacity. The resistance of an aerial line is a function of the length of the line, the diameter of the wire, the material of which it is made and the temperature. Wire tables give the resistance of all commercial sizes of wire at temperatures within the range met in practice, and this need not be dwelt upon.

The leakage, or more properly speaking, the leakage conductance of a transmission line, is the reciprocal of the insulation resistance. The insulation of lines whose physical condition is of the best is so high as to be negligible, excepting the condition of wet weather. The ordinary measurements of the leakage resistance are in the nature of the measurement of a high resistance, and are so common as to need little comment. The ordinary method of determining insulation resistance is the well-known voltmeter method.

The third property of transmission lines is inductance. A magnetic field is inseparably associated with an electric current. The magnetic field about a transmission line consists of closed lines of magnetic flux, which are linked with the circuit. Any one of these closed lines lies in a plane perpendicular to the transmission line. The inductance may be defined as the total number of lines of magnetic flux which pass through or are linked with a unit length of the circuit when a unit current traverses the circuit longitudinally.

The formula for the inductance of a single aerial wire, composing a ground circuit, may be expressed by the equation No. 1 which follows:

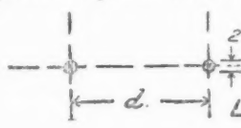


$$L = \left[0.08045 + 0.7412 \log_{10} \frac{2h}{r}\right] 10^{-3}$$

FORMULA NO. 1.

Where L is the inductance per mile in henries, h is the height of the wire above the earth and r the radius of the wire; h and r should be expressed in the same units.

The inductance of a two-wire aerial metallic line may be expressed by the formula No. 2:



$$L = \left[0.1609 + 1.482 \log_{10} \frac{d}{r}\right] 10^{-3}$$

FORMULA NO. 2.

Where L is the inductance per mile of line, d is the distance between the centers of the two wires and r is the radius of either wire; d and r should be expressed in the same units.

Both of the above formula are for wires made of non-magnetic material. The inductance of iron or steel wires is greater than that of copper wires of the same size. The formula for iron or steel wires may be found in the "Electrical Papers" of Oliver Heaviside.

The logarithms are, as the subscripts denote, to the base 10, or common logarithms.

The effect of the earth on the inductance of a metallic circuit is less than a fraction of one per cent if the wires are above the earth a distance greater than two or three times the distance between them. The inductance is decreased by the presence of the earth. These formula assume that there are no magnetizable substances within a distance of the circuit greater than several times the distance between the wires of a pair or the height of a wire above the earth.

The fourth property of transmission lines is the electrostatic capacity. Every transmission line possesses the property of retaining or storing an electrical charge in the manner in which any condenser does so. The phenomena which takes place in the charging of a condenser is that of setting up electrical stresses in the dielectric between the plates of the condenser and producing an apparent displacement, as a result of the stresses, of the ether. The result of this at the surfaces of the condenser plates is the phenomena termed surface charge. It was Farady's conception that the energy of a static charge was distributed throughout the volume of the dielectric composing the disturbed space between the plates. The analogy of this may be found in the displacement of a spring when subjected to an external force, work being done on the spring by the external force until the spring develops a reaction and opposes the impressed force with an equal and opposite force, and a state of equilibrium results. In this state of equilibrium the fibers of the spring are in a state of stress and the force exerted in producing the displacement, multiplied by the extent of the displacement—that is, the distance through which the spring moved before equilibrium was established—gives the work stored in the spring. This work is returned or delivered from the spring when it assumes its position of equilibrium and the external forces are zero.

The formula No. 3 for the static capacity of a single aerial wire, grounded circuit, follows:

$$C = \left(\frac{0.03884}{\log_{10} \frac{2h}{r}}\right)^{10^{-6}}$$

FORMULA NO. 3.

Where C is the capacity of the line in Farads per mile, h is the height of the wire vertically from the earth and r the radius of the wire; h and r being expressed in the same units.

A covering of insulation on the wire has the effect of increasing its capacity slightly.

The formula No. 4 for the capacity of a two-wire aerial metallic circuit follows:

$$C = \left(\frac{0.01942}{\log_{10} \frac{d}{r}}\right)^{10^{-6}}$$

FORMULA NO. 4.

Where C is the static capacity of the line in Farads per mile, d is the distance between the centers of the wires and

Paper read before the Association of Railway Telegraph Superintendents at New Orleans, La.

r is the radius of either wire; and d and r are expressed in the same units.

This formula is modified when the wires are insulated, and the capacity is slightly increased.

The formula for these cases may be found also in Heaviside. Formulas No. 3 and No. 4 are correct for wires of magnetic or non-magnetic material.

The presence of the earth beneath an aerial metallic circuit increases the capacity very slightly, but less than a fraction of one per cent if the wires are above the earth a distance several times the distance between the wires.

The assumption made, in the deduction of the formula for static capacity, is that there are no other wires in the immediate vicinity of those being considered. The effect of adjacent circuits is to increase the effective capacity of a line as given in formulas 3 and 4, as will be shown later.

II.—The nature of the transmission and the distribution of energy.

The simplest conception of a transmission line is that of a small reservoir of energy filled and emptied at an enormous velocity. The energy which may be stored in a transmission line of ordinary length, to which a commercial electro motive force is applied, and which is traversed by currents of ordinary strength, is exceedingly small and would be of the magnitude of a few foot pounds. Such a line operates, however, at a velocity slightly less than that of light, the velocity of light being 186,000 miles per second. The velocity of propagation of free electro-magnetic waves in the ether is the same as the velocity of light, and light is itself an electro-magnetic phenomenon.

It will be seen in a moment that the function of the wire or wires of a transmission line is merely that of a guide and not that of transmitting the energy.

Considering the four properties of a transmission line, it will be seen that of the energy delivered to the line there are, in its distribution, four components. The relative values of these components among themselves are determined by the relative values of the four properties of the line. This is almost exactly true of very long lines, but is modified in short lines, where the reaction of the terminal apparatus is greater compared with the line reaction. The ohmic resistance of the line causes a drop in electro-motive force along the line and determines the energy lost in heatnig the conductor, which is commonly called the $I^2 R$ loss; this energy cannot be recovered. It appears as heat, elevates the temperature of the wire slightly and is radiated to the atmosphere. The current which flows through the leakage paths results in a loss of energy, which heats those paths and likewise is dissipated into the atmosphere. The resistance reaction and the leakage reaction of a line are termed "dissipative" because the energy expended cannot be recovered.

The establishment of the magnetic field about the line, when a current is made to traverse the line longitudinally, results in the storage of energy in this field. The reaction due to the magnetic field appears as a retarding electro-motive force in the circuit when the current is established and as a prolonging electro-motive force when the current vanishes—that is, the effect of the magnetic field on a change in the current strength in the line is analogous to the effect of inertia on a change of motion. A steady direct current through a circuit possessing a magnetic field is analogous to the uniform motion of a body. Any change in the rate of motion or the speed of a body is opposed by the inertia. This opposition is apparent in the force equal and opposite to the impressed force causing the change in the motion.

The energy delivered from the circuit to the magnetic field is returned by the field to the circuit when the energizing current is interrupted or made to vanish.

The energy stored in the magnetic field, due to a circuit of inductance "L," traversed by a steady direct current "I," is $\frac{1}{2} L I^2$. Of this energy a very large percentage is stored in the dielectric about the wire.

The last component of line energy is that stored in the static charge of the line. This energy, as explained before, is stored in the dielectric about the line. It is necessary, in order to raise the potential of the distant end of the line, to charge the whole intervening line, and consequently there is an expenditure of energy. This energy is returned to the line from the dielectric when the impressed electro-motive force is removed from the line.

The energy expended in charging the static field is $\frac{1}{2} C V^2$, where C is the total capacity and V is the electro-motive force impressed on the line.

The reactions due to the magnetic field and to the static field are termed "non-dissipative," because in a complete cycle of operations—that is, the establishment and removal of an electro-motive force, or the establishment and removal of a current—the total expenditure of energy in the fields is zero. Therefore, to summarize: Energy is expended in the line in overcoming the line drop, the back electro-motive force of self-induction, supplying the advance current to charge the static field, and in supplying the leakage current, the latter being in general negligible, except under the conditions noted above.

It will be seen from a consideration of these four reactions that the line of greatest efficiency is the one whose magnetic reaction predominates over the other reactions. Evidently, the dissipative reactions should be made a minimum.

The capacity reaction, while not dissipative, is not directly a factor in transmitting energy, because the charging current which establishes the static field is transverse with respect to the line, rather than longitudinal. The magnetic reaction, however, while it retards the establishment of a line current, tends to prolong that current circuitally through the line, and a magnetic reaction, great compared to the other three reactions, results in a circuital line current of maximum transmitted energy.

III.—The field of force and flux due to a transmission line —with reference to diagrams.

An investigation of the magnetic and the static fields about the transmission line will best lead to an understanding of the theory of induction. The magnetic force without a wire which carries the current "I" is expressed by the equation No. 5 which follows:

$$F = \frac{2\,I}{r}$$

FORMULA NO. 5.

Where F is the force at a point distant r perpendicularly from the wire, acting perpendicularly through a plane containing the point and the wire.

Considering the metallic line, we shall have for the force due to two wires the expression No. 6:

$$F = 2\,I\left(\frac{1}{r_1} - \frac{1}{r_2}\right)$$

FORMULA NO. 6.

Where F is the force, I is the current traversing up one wire and down the other, r_1 is the perpendicular distance from one wire, and r_2 is the perpendicular distance from the other. By means of this formula the direction and the magnitude of the magnetic field may be determined for all points about the circuit.

The potential at any point without the wires is given by the expression No. 7:

$$V = 2\,q_1 \log \frac{r_2}{r_1}$$

FORMULA NO. 7.

Where V is the potential at the point distant r_1 from the wire, whose charge per unit length is q_1 and distant from the other wire r_2.

By means of formulas 6 and 7 the lines of magnetic flux and the lines of electric flux, or respectively the magnetic

and the static fields, may be completely determined, and these are given in Fig. 1.

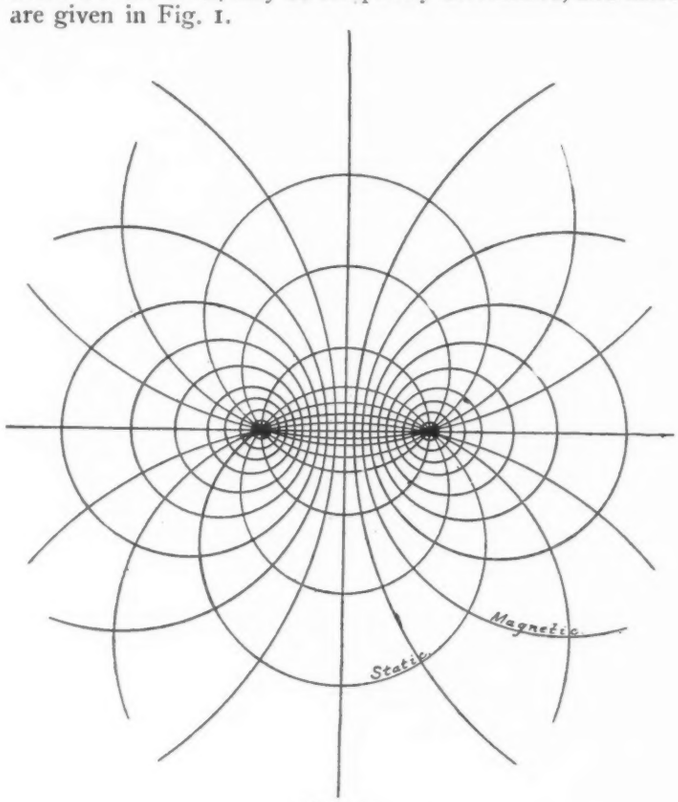


FIG. 1.

Showing the direction of the static and the magnetic fields for a metallic circuit.

The closed lines encircling either wire represent the direction of the magnetic field. The lines which start on either wire and terminate on the other wire represent the static field. The fall of potential in the dielectric along any static line is continuous from one wire to the other. It will be observed that the static lines and the magnetic lines intersect each other everywhere at right angles and that any magnetic line is a line of constant potential.

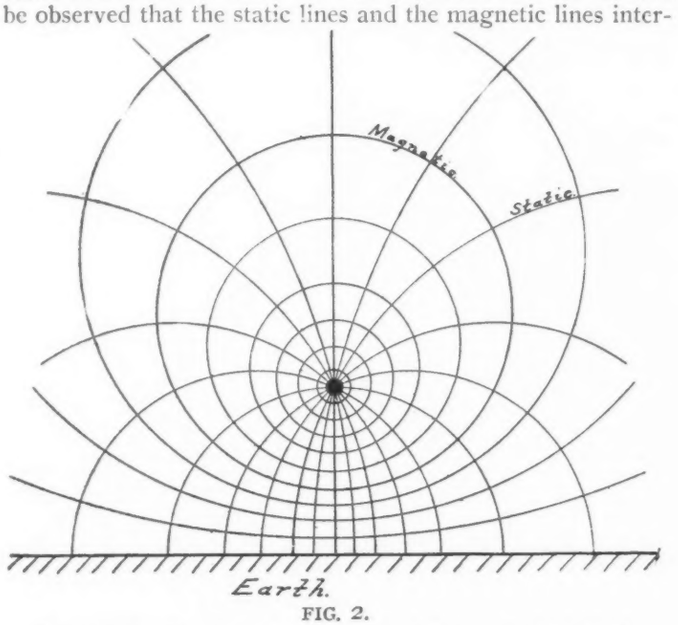


FIG. 2.

Showing the direction of the static and the magnetic fields for a grounded circuit, assuming complete penetration into the earth of the return current.

It will be observed also that the line perpendicular to the line joining the two wires in the diagram is at zero potential. If it be assumed that this line at zero potential is the surface of the earth, and the wire which should fall within the earth be imagined to have vanished, the field left above the earth will be that due to a single aerial wire grounded line. This is shown in Fig. 2.

It is important to note that the potential and the flux intensity diminish very rapidly as one passes away from the circuit at right angles. Equation 6 has been put in a little different form in order to show how the flux intensity—that is, the density of the magnetic field—diminishes along the straight line joining the two wires, both between the wires and without the wires. This is shown in Fig. 3.

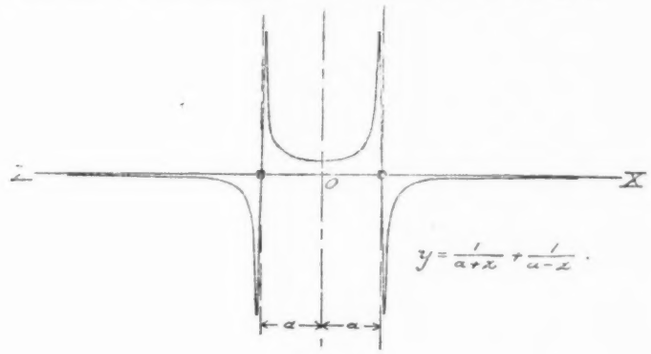


FIG. 3.

Showing the intensity of the magnetic field, along the X axis, for a metallic circuit.

It will be noted that the magnetic density is great only at points very close to the wires, and that it diminishes very rapidly, passing away from the circuit on either side to a distance several times the distance between the wires.

Expression 7 has likewise been put in form to show how the potential varies along the same straight line joining the two wires. This is shown in Fig. 4.

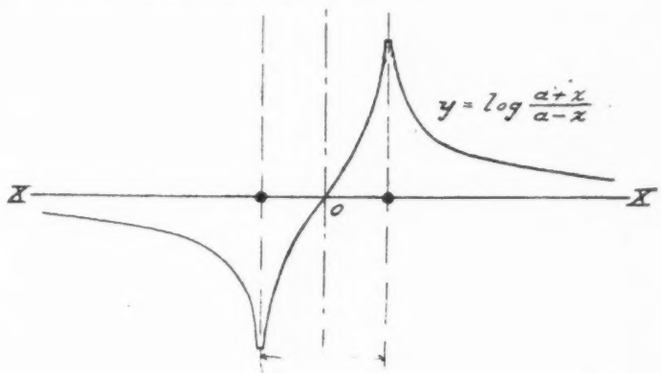


FIG. 4.

Showing the potential of the static field, along the X axis, for a metallic circuit.

It will be observed that the potential, as well as the density of the magnetic field, diminishes very rapidly at an appreciable distance from the circuit. This potential is not so small, however, as to be incapable of producing a disturbance in telephonic lines.

IV.—The reasons for mutual interference. The formula of mutual capacity and mutual inductance; three cases, two grounded lines, one grounded and one metallic line, two metallic lines.

Considering now the case of a second metallic circuit within the field of the circuit shown in Fig. 1: If the two wires of the second circuit lie on a magnetic flux line of the circuit, it is evident that the two wires of the second circuit will be at the same potential and that there will pass between them none of the magnetic flux lines due to the circuit of Fig. 1. It follows that these two circuits have no mutual

properties and that a current in one or an electro-motive force in one is without influence on the other.

However, this is not the case when the two wires of the second circuit are in any other relation to the wires of Fig. 1. It generally occurs that the wires of the second circuit are in such positions that the static potential at one is not the same as the static potential at the other and that a portion of the magnetic flux due to the circuit of Fig. 1 passes through and is linked with the two wires of the second circuit; and this gives rise to a difference of potential between the two wires of the second circuit when an electro-motive force is impressed on the first; and it gives rise to a generated electro-motive force around the second when there is a change of current in the first.

The magnetic interference is similar to the action of the primary on the secondary winding of a transformer.

The formula No. 8 for the mutual capacity between two metallic aerial circuits is:

$$-C_{ab} = \frac{2\log_{10}\frac{r_{14}\,r_{23}}{r_{13}\,r_{24}}}{\left(2\log_{10}\frac{r_{12}^2}{r_1^2}\right)\left(2\log_{10}\frac{r_{34}^2}{r_3^2}\right)-\left(2\log_{10}\frac{r_{14}\,r_{23}}{r_{13}\,r_{24}}\right)^2}$$

FORMULA NO. 8.

Where C a b is the capacity between the lines, $r_{1\,2}$ is the distance between the wires 1 and 2, $r_{1\,3}$ is the distance between the wires 1 and 3, $r_{1\,4}$ is the distance between wires 1 and 4, etc.

This expression gives the charge which would be induced on each wire of the circuit 3 and 4, due to an impressed electro-motive force of one volt between the wires of the circuit 1 and 2. Wires 1 and 2 may be assumed to be the two wires of the circuit shown in Fig. 1, and 3 and 4 the two wires of the circuit on which there is an induced charge from circuit one.

The capacity of the circuits 1, 2 and 3, 4 are both modified slightly from the expressions given in equation No. 3. The new expressions are 9 and 10 which follow:

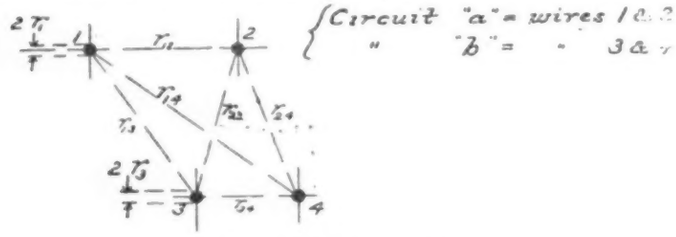
$$C_a = \frac{2\log_{10}\frac{r_{34}^2}{r_3^2}}{\left(2\log_{10}\frac{r_{12}^2}{r_1^2}\right)\left(2\log_{10}\frac{r_{34}^2}{r_3^2}\right)-\left(2\log_{10}\frac{r_{14}\,r_{23}}{r_{13}\,r_{24}}\right)^2}$$

FORMULA NO. 9.

$$C_b = \frac{2\log_{10}\frac{r_{12}^2}{r_1^2}}{\left(2\log_{10}\frac{r_{12}^2}{r_1^2}\right)\left(2\log_{10}\frac{r_{34}^2}{r_3^2}\right)-\left(2\log_{10}\frac{r_{14}\,r_{23}}{r_{13}\,r_{24}}\right)^2}$$

FORMULA NO. 10.

Where Ca is the capacity of circuit composed of wires 1 and 2, Cb is the capacity of circuit composed of wires 3 and 4, the characters r_1 and r_3 are respectively the diameters of the wires of circuits 1 and 2, and 3 and 4.



FORMULA NO. 10A.

To reduce (8), (9) and (10) to microfarads per mile, multiply by 0.07768.

The three preceding equations, 8, 9 and 10, when multiplied by 0.07768, give capacity in microfarads per mile; and the microfarads per mile are changed to farads per mile by multiplying by 10^{-6}.

The mutual inductance between circuits one and two, and three and four is given by the expression No. 11 which follows:

$$M_{ab} = 0.3706\left(2\log_{10}\frac{r_{14}\,r_{23}}{r_{13}\,r_{24}}\right)10^{-3}$$

FORMULA NO. 11.

Where Mab is the mutual inductance in henries per mile, and $r_{1\,4}$, $r_{2\,3}$, $r_{1\,3}$, $r_{2\,4}$ are the respective distances between wires 1 and 4, wires 2 and 3, wires 1 and 3, wires 2 and 4, as given above.

The self-inductance of circuits 1 and 2, and 3 and 4 is unchanged and as given in equation No. 2.

It is evident from equations Nos. 8 and 11 that the mutual inductance and the mutual capacity are each zero when the following condition is true, as expressed in the equation No. 12:

$$r_{14}\,r_{23} = r_{13}\,r_{24}$$

FORMULA NO. 12.

Equation 12 gives the condition under which both the static and the magnetic disturbances between the two lines are zero. It is evident from equation 12 that two metallic lines may be so arranged as to have no mutual interference. If more than two metallic lines are considered equation 12 must hold between any two pairs in the system.

Considering now the case of mutual interference between one aerial grounded circuit and one aerial two-wire metallic circuit, it is evident that we may approximate the condition by considering the case of two parallel metallic circuits, of which one metallic circuit has one wire removed to such a great distance that its effect is negligible. The formula (No. 13) for the mutual capacity in this case is as follows:

$$-C_{ab} = \frac{2\log_{10}\frac{r_{14}\,r_{23}}{r_{13}\,r_{24}}}{\left(2\log_{10}\frac{2h_1}{r_1}\right)\left(2\log_{10}\frac{r_{34}^2}{r_3^2}\right)-\left(2\log_{10}\frac{r_{14}\,r_{23}}{r_{13}\,r_{24}}\right)^2}$$

FORMULA NO. 13.

The formulas Nos. 14 and 15 for the capacity of the grounded line and the metallic line are:

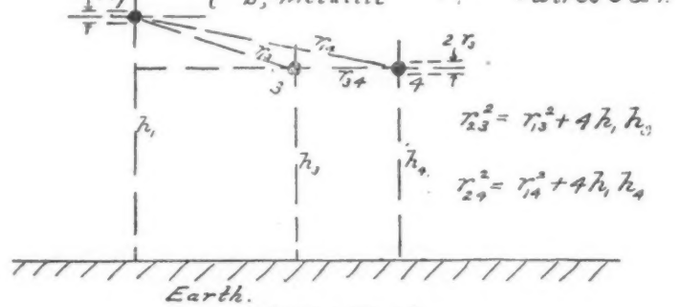
$$C_a = \frac{2\log_{10}\frac{r_{34}^2}{r_3^2}}{\left(2\log_{10}\frac{2h_1}{r_1}\right)\left(2\log_{10}\frac{r_{34}^2}{r_3^2}\right)-\left(2\log_{10}\frac{r_{14}\,r_{23}}{r_{13}\,r_{24}}\right)^2}$$

FORMULA NO. 14.

$$C_b = \frac{2\log_{10}\frac{2h_1}{r_1}}{\left(2\log_{10}\frac{2h_1}{r_1}\right)\left(2\log_{10}\frac{r_{34}^2}{r_3^2}\right)-\left(2\log_{10}\frac{r_{14}\,r_{23}}{r_{13}\,r_{24}}\right)^2}$$

FORMULA NO. 15.

To reduce (13), (14) and (15) to microfarads per mile, multiply by 0.07768.



FORMULA NO. 15A.

The mutual inductance in this case is given in the following equation, No. 16:

$$M_{ab} = 0.3706\left(2\log_{10}\frac{r_{14}\,r_{23}}{r_{13}\,r_{24}}\right)$$

FORMULA NO. 16.

Where wire No. 2 of circuit 1 and 2 is assumed to have been removed to a great distance.

The condition for the mutual non-interference in this case is given in equation 17:

$$r_{14}\, r_{23} = r_{13}\, r_{24}$$

FORMULA NO. 17.

Considering the last case of two parallel grounded aerial circuits, the formula for the mutual capacity is given in expression 18:

$$C_{ab} = \frac{2 \log_{10} \frac{2h_{12}}{r_{12}}}{\left(2 \log_{10} \frac{2h_1}{r_1}\right)\left(2 \log_{10} \frac{2h_2}{r_2}\right) - \left(2 \log_{10} \frac{2h_{12}}{r_{12}}\right)^2}$$

FORMULA NO. 18.

The formulas for the self-capacity of each circuit are given in expressions 19 and 20:

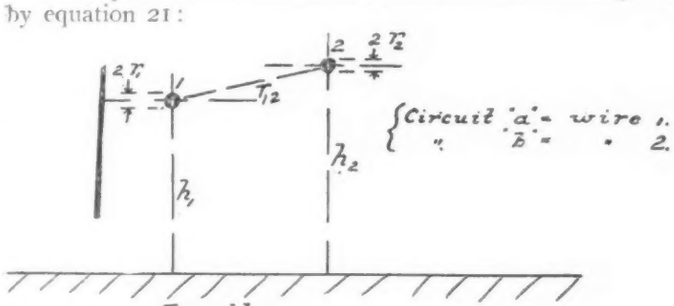
$$C_a = \frac{2 \log_{10} \frac{2h_2}{r_2}}{\left(2 \log_{10} \frac{2h_1}{r_1}\right)\left(2 \log_{10} \frac{2h_2}{r_2}\right) - \left(2 \log_{10} \frac{2h_{12}}{r_{12}}\right)^2}$$

FORMULA NO. 19.

$$C_b = \frac{2 \log_{10} \frac{2h_1}{r_1}}{\left(2 \log_{10} \frac{2h_1}{r_1}\right)\left(2 \log_{10} \frac{2h_2}{r_2}\right) - \left(2 \log_{10} \frac{2h_{12}}{r_{12}}\right)^2}$$

FORMULA NO. 20.

The expression for mutual inductance in this case is given by equation 21:



$$2h = \sqrt{r_{12}^2 + 4h_1 h_2}$$

FORMULA NO. 20A.

To reduce 18, 19 and 20 to microfarads per mile, multiply by 0.07768.

$$M_{ab} = 0.3706 \left(\log_{10} \frac{4h_{12}^2}{r_{12}^2} \right) 10^{-3}$$

FORMULA NO. 21.

The self-inductance of the two circuits is unaltered and is given in expression No. 1.

In treating the case of induction from circuits energized by simple alternating currents, the induced currents in a neighboring circuit are given by the following formulas:

If the mutual inductance is M and the current in the disturbing circuit is I, the induced electro-motive force is—

$$E_2 = M_{ab} w I_1$$

where $w = 2\pi n$

n = *frequency, in cycles per second, of the inducing current.*

FORMULA NO. 22.

This electro-motive force acts in such a manner as to produce a current flow around through the disturbed circuit.

If the mutual capacity is Cab, the transfer of current from the disturbing to the disturbed circuit—that is, from the inducing circuit to the circuit in which there is an induced current—is:

$$I_2 = C_{ab}\, w\, E_1$$

FORMULA NO. 23.

Where I_2 is the total induced current in the second or disturbed circuit, Cab is the mutual capacity and E_1 is the impressed *E. M. F.* on the primary or disturbing circuit. The current I_2 does not flow around the second circuit, but divides and a portion of it flows toward each terminal.

The foregoing formulas of mutual capacity, mutual inductance, the induced *E. M. F.* and the induced current provide the necessary data for determining the magnitude of the induced *E. M. F.* and current in simple cases of induction where the primary or disturbing circuit is energized by a simple sinusoidal alternating current.

V.—Deduction from formula of Sec. 4 of the theory of transposition and the extent to which transposition neutralizes mutual interference.

A transposition may be defined in the case of a two-wire metallic circuit as a rotation of the circuit through 180 degrees, or what amounts to the same thing, interchanging the two wires in their relative positions.

For the case of metallic circuits it is evident from equations 8 and 11 that a rotation of 180 degrees or a transposition of a two-wire circuit changes the signs of the constants of mutual capacity and mutual inductance—that is, it reverses the direction of the induced *E. M. F.* due to magnetic induction—and it reverses the direction of the induced charges and the currents due thereto, which are due to static induction. It is evident, therefore, that the location of a transposition at the proper point in one of two mutually inductive metallic circuits will cause the disturbances on one side of the transposition to be equal and opposite to the disturbances on the other side of the transposition, and the resultant induced *E. M. F.* and the resultant induced current will be made to vanish.

It is evident also from equations 13 and 16, in the case of a single grounded aerial wire and an aerial metallic circuit, that a transposition of the metallic circuit will produce the same result.

An inspection of equations 18 and 21 shows, however, that in the case of two parallel aerial grounded wires a transposition is an impossibility. This arises from the fact that an interchange of the positions of the two aerial grounded wires will have no effect in changing the constants of static and magnetic induction; and it will be seen, therefore, at once that cross-talk and foreign induction in metallic lines may be eliminated; and in grounded lines only where the grounded line is exposed to a metallic line and transpositions are inserted in the metallic line, it being impossible to transpose a grounded line.

It is not possible, in the case of mutually transposed lines, to make the mutual disturbance completely vanish in all cases. The following diagram, Fig. 5,

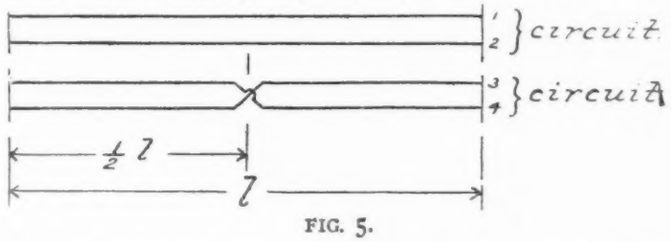


FIG. 5.

will illustrate the reason for this. In Fig. 5, 1 and 2 is to be considered as one metallic circuit, and 3 and 4 a second metallic circuit transposed at its middle point. If the current in 1 and 2 is constant throughout its entire length, irrespective of the manner in which it may change in actual magnitude from time to time, however, the induced *E. M. F.* in wire 3, to the right of the transposition, will be equal and opposite to the induced *E. M. F.* in the wire 4, to the left of the transposition, assuming that the upper wire is 3 and the lower wire 4; consequently, the transposition causes the magnetically induced *E. M. F.* in 3 and 4 to vanish.

If the potential of circuit 1 and 2 is constant throughout

its entire length, the induced charge on wire 3 will be equal and opposite for the part of wire 3 which is at the right of the transposition, to the charge induced on wire 4 to the left of the transposition; and, therefore, these two charges being equal and opposite, will merge through the transposition and vanish.

Each of these effects is modified if the length "1" of exposure is very great, the reason for this being that the potential along 1 and 2 is not constant, but gradually diminishes, due to the line drop in 1 and 2; and to the fact that the current in 1 and 2 is not constant along its entire length, due to the amount which is lost in charging the line; and the length "1," of exposure, must be made short enough so that the assumption of constant *E. M. F.* and constant current throughout the length of exposure will be approximately true.

The case when terminal apparatus is connected to circuit 3 and 4, at the ends of the section of exposure, is slightly different from that given above, owing to the fact that part of the charge on wire 3 will pass through the terminal apparatus to wire 4 and vanish, the remainder of the charge on wire 3, on the right of the transposition, passing through the transposition and vanishing, as above described. Of course, the current through the terminal apparatus connected with 3 and 4 may be made as small as desirable by inserting a sufficient number of transpositions.

The insertion of a transposition in circuit 1 and 2, opposite to and at the same point as the transposition in circuit 3 and 4, will produce the same result as though neither circuit were transposed, as is evident from an inspection of the equations for the mutual capacity and the mutual inductance.

The transposition of a circuit containing more than two wires is accomplished as follows, and is shown in Fig. 6:

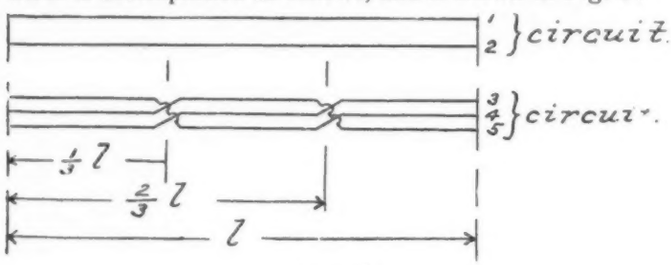


FIG. 6.

This illustrates exposure of a single metallic line to a three-wire metallic line, which may be considered as part of a three-wire distribution on the Edison system, or a three-phase transmission line, or a three-wire two-phase line. Two transpositions are necessary in this case, each exposure being one-third of the total length of exposure; and the transpositions in the three-wire line amount virtually to a revolution of the line through 120 degrees. The second transposition in the line represents a further revolution through an additional angle of 120 degrees. Thus the two-wire line is exposed to three consecutive sections of the three-wire line in such a manner that the total induced current and *E. M. F.* are made to vanish.

In general the transposition of a circuit having "n" wires will require (1/n) transpositions, the distance from one end of the section of exposure to the first transposition being 1/n of the total length of exposure, and each successive transposition occuring at a regular interval of 1/n of the total length of exposure.

VI.—Transposition of telephone lines to eliminate cross-talk. Derivation of types and the method of sections within which all disturbances are made to vanish. The unit of treatment in all cases.

Taking up now the matter of transposition of telephone lines among themselves for the elimination of mutual disturbances between themselves, it is necessary to adopt a certain standard length of section within which all the wires shall be transposed, as hereafter shown, and within which all of the mutual disturbances are made to vanish. The advantage of this is realized in securing a standard unit length to apply in transposing telephone lines carrying a large number of wires. The importance of this is seen when it is considered how complicated such systems may become, the complications consisting of the junction of two large trunk lines, the occurrence of intermediate offices, the bridging on of local stations and the insertion in the line of any such intermediate apparatus as may be desirable.

The procedure of transposing in such a case is to take the standard section, starting from one end of the line and applying it consecutively until next to the last section is reached, before some radical change in the line, such as the junction with another line or the removal from the line or the termination of one or more or several pairs of wires, in which case the remainder, after taking the greatest number of standard sections, is, if less than half the length of a standard section, added to the preceding section, which is made a special section but transposed like a standard section, with longer lengths of exposure. If the remainder is greater than half the length of a standard section, it is made a special section and transposed like a standard section, the lengths of exposure being shorter than in a standard section.

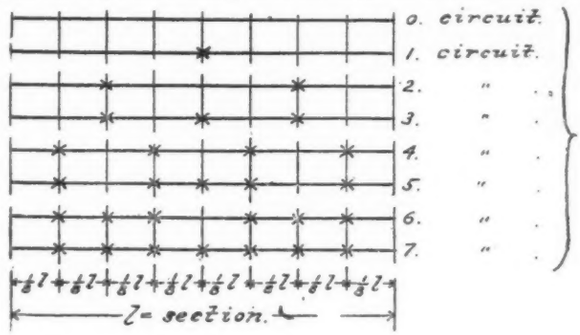


FIG. 7.

Eight types of transposition in a standard unit section

	0	1	2	3	4	5	6	7
0								
1	1/2							
2	1/4	1/4						
3	1/4	1/4	1/2					
4	1/8	1/8	1/8	1/8				
5	1/8	1/8	1/8	1/8	1/2			
6	1/8	1/8	1/8	1/8	1/4	1/4		
7	1/8	1/8	1/8	1/8	1/4	1/4	1/2	

FIG. 7A.

Actual exposures of Fig. 1.

Fig. 7 shows the manner in which various types of transposed lines are derived. The particular case here treated is that of eight possible types, in which the type having the minimum number of transpositions is untransposed; the type having the maximum number of transpositions in the standard section has seven. The method, however, as a general thing, may be extended to include as many types as are necessary. It will be noted that each type in the progressive development has one more transposition than the preceding. In the diagram the single line is taken as representing a metallic circuit and the crosses represent transpositions.

A convenient length to take for "1," where the number of circuits does not exceed twenty or thirty, is between five and ten miles. The point is to adopt a length in connection with the standard line span in use, such that the transpositions will fall at convenient places, and that the shortest

length between two consecutive transpositions will be an integral multiple of the standard pole span.

The best standard of exposure between two adjacent horizontal circuits on a ten pin cross-arm is one-quarter mile between transpositions. If two such adjacent circuits are transposed one-quarter mile from one of the terminals and then at each consecutive half mile to the distant terminal, it will be found that with the standard of transmission now in general use the cross-talk will be entirely negligible and under normal conditions absolutely inapparent.

The manner of determining how often to transpose circuits which are not adjacent may be determined in the following manner:

Calculate from equation 11 the mutual inductance between two adjacent circuits on the same cross-arm and divide the result by 4, obtaining the mutual inductance for a parallel section of one-quarter mile.

Then to determine the permissible theoretical exposure between any two circuits in the line, calculate by equation 11 the mutual inductance for a parallelism of one mile. Divide this result into the mutual inductance for the case first calculated, that of the parallelism between two adjacent circuits on the same arm exposed to each other for one-quarter mile. This will give the length of exposure between any two circuits, so that the mutual inductance will be equal to the mutual inductance of the standard for two adjacent circuits parallel for one-quarter mile.

It would have been equally logical to make the calculation on the basis of mutual capacity as given in formula 8, but it will be noticed that the numerator of the expression in No. 8 is of the same form as expression 11; and it will be noticed that the denominator of expression No. 8 depends only on the radii of the wires and the distance between two wires of a pair, both of these distances being constant for all pairs in the system. The second term in the denominator of No. 8 is very small compared with the first term and may often be neglected.

A special case of a ten-wire line is herewith given, showing the permissible theoretical exposures on a quarter mile basis. The results are given in table No. 1.

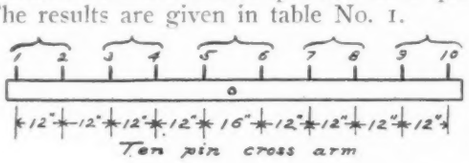


FIG. 7A.

	1-2	3-4	5-6	7-8	9-10
1-2					
3-4	0.25				
5-6	0.90	0.21			
7-8	2.85	1.31	0.21		
9-10	4.95	2.85	0.90	0.25	

TABLE I.

Theroetically permissable exposures for five circuits on a ten pin arm, based on an exposure of ½ to ¾ of one-fourth mile. Tabular values in miles.

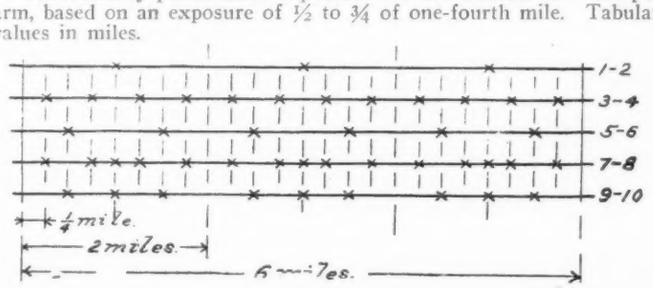


FIG. 8.

A method of transposing ten wire lines, using two mile sections.

Fig. 8 shows the application of the results in table No. 1, and the method of Fig. 7 to the transposition of a ten-wire line, showing several complete sections. The important point is to so transpose the line as to fulfill the requirements of the table of theoretical exposures. There are many ways of accomplishing this, but in general the best way is that which employs the minimum number of transpositions which will fulfill the requirements.

The general rule in applying a standard unit section to any line is to make any discontinuity in the line the junction of two contiguous sections. A discontinuity is constituted by the junction with the line of other lines coming to the main line or leaving it, and also a point at which the whole or any part of the line enters an intermediate or a terminal office.

The cross-talk between grounded and aerial lines of considerable length will ordinarily be serious, and there is no means of transposition. It is possible, however, to lay out transposition points as before, and to insert grounded repeating coils or transformers at the suppositious transposition points. This is interesting only as a theoretical proposition, because it renders line maintenance a very difficult matter.

The mutual induction between aerial grounded wires used for telegraphic purposes, where direct currents are employed, is slight and readily overcome by proper terminal apparatus.

The use of aerial unsheathed cable is particularly to be avoided, because the wires of different circuits are within a fraction of an inch of each other, while all of them are probably twenty-five or thirty feet from the ground; and an inspection of formulas 18 and 21 will show that between aerial grounded wires the constants of mutual inductance are a maximum when the distance between the wires is a minimum and the height above the earth is a maximum. Such aerial cables should be incased in a metallic sheath and the sheath grounded. This brings the ground so close to the wires as to make the induction no more serious than in the case of an open wire grounded line.

It is important to note that the use of phantom circuits in multiplex telephony requires not only the simple transposition of the lines themselves, but also the complete transposition of lines as a whole. For example: A phantom transposition would be the change of wires 1 and 2 to pins 3 and 4, and wires 3 and 4 to pins 1 and 2. The use of phantom circuits has never been extensive and such transposition has never been required in practice. The phantom circuits which have been tried experimentally have seldom been satisfactory quiet circuits, owing to the fact that the line was not properly transposed so as to make the phantom circuit mutually non-inductive with other circuits.

VII.—Transposition of telephone lines to eliminate induction from foreign lines of high energy. Theory of the method in the simplest case. The procedure when the situation becomes too complicated—use of twisted pairs, aerial cable or electro-magnetically shielded conductors.

The transposition of telephone lines as a whole to eliminate induction from foreign lines of high energy, carrying either high potentials or large currents, is an exceedingly important branch of the subject of transposition. This matter is becoming more and more important, especially with the development of high-tension transmission.

The theory of transposing a line exposed for a short distance to a two-wire line carrying a high energy alternating current is identical with the theory of transposition shown in Fig. 5, where 3 and 4 shows how every telephone circuit should be transposed, and 1 and 2 represents the disturbing alternating current circuit.

The important feature is the manner of transposition when the exposure becomes complicated by the fact of transformers or arc lights in the alternating current circuits and regular transpositions in the telephone circuits within the section of exposure.

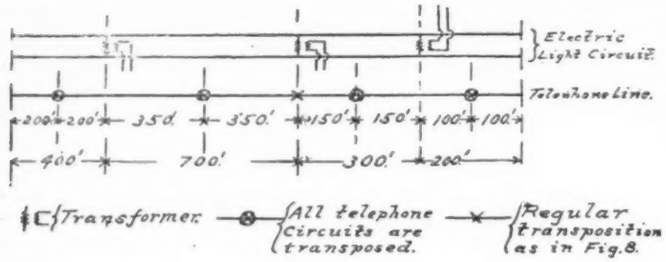

Electric Light Circuits
Telephone Line
200' 200' 350' 350' 150' 150' 100' 100'
400' 700' 300' 200'
Transformer
All telephone circuits are transposed.
Regular transposition as in Fig. 8.

FIG. 9.

Method of transposing telephone lines against constant potential electric light circuits.

Fig. 9 shows the manner of transposition for a telephone line exposed to an alternating current line to which are connected several transformers. The section between two consecutive transformers is to be treated as a section in which the mutual disturbances are to be caused to vanish. The reason for this is found in the fact that the magnetic disturbance in the telephone line is not constant, because the current in the alternating current line is changed at any point where a transformer is bridged on; and this change in current will vary throughout the day with changes in the load on the electric light system. It should be noted that points opposite the transformers are neutral points—that is, they are the junction of two contiguous sections, and transpositions at these points will not affect the disturbance in the telephone circuits. Therefore, regular transpositions in the telephone circuits to eliminate cross-talk should be located at these neutral points, if necessary. A slight deviation of the regular transpositions one way or the other from the exact points at which they should occur may be neglected.

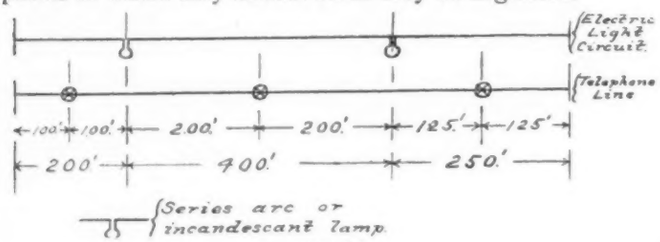


FIG. 10.

Method of transposing telephone lines against constant current electric light circuits.

Fig. 10 shows the manner of transposition against an arc-light circuit. The distance between two consecutive arc lamps should be treated as a single section, to be transposed at the middle.

At points where transpositions are located to eliminate foreign induction all the telephone circuits are to be transposed in every case.

It is to be observed that the exposure to a single wire series arc-light circuit represents one of the worst cases of induction met in practice. The development of the alternating current series arc-light system has been extremely rapid, owing to its cheapness and to the flexibility with which it fits into a large alternating current system. Trouble due to these circuits is being met all over the country. When the exposure becomes more complicated the method is outlined in Fig. 11.

It will be seen by an inspection of Fig. 11 that the length of exposure between two consecutive changes of any character in the circuits of high energy is treated as a special section, at the middle of which all the telephone circuits are to be transposed. The following general rule may be given to cover all cases:

Treat as one section the distance between two consecutive changes of any character in any of the disturbing circuits. Transpose all the telephone wires at the middle of each such section.

These changes or discontinuities in the disturbing circuits occur wherever an arc light, for example, is inserted in one of the circuits, where a transformer is bridged from one of the alternating current circuits, where any one of the circuits changes abruptly its distance from the telephone circuits and where additional alternating current circuits join the disturbing circuits or where any of the disturbing circuits are transposed.

In the alternating current distributing systems, for electric light and power in large towns and cities, it is not general practice to transpose the distributing circuits. In the case of long distance high tension transmission it is common practice to transpose the circuits.

In two-wire single-phase systems or in four-wire two-phase systems the transpositions are usually made in the same manner as a standard telephone transposition.

In the case of three-wire three-phase lines it is necessary to insert two transpositions in one non-inductive section. This is accomplished by transposing the line at a distance one-third of the total from one end, and at a distance two-thirds of the total distance from that end, by rotating the circuit one-third of a revolution at the first transposition and an additional one-third of a revolution in the same direction at the second transposition. Where such spirals, as they are termed, occur within the section of exposure to telephone lines, the spirals should in general be treated as discontinuities and made the location of a neutral point with reference to the telephone transpositions.

In general, in transposing against electric light induction or induction from power lines, it is well not to depend upon transpositions in the power or electric light circuits. The advantage thus secured is that of making a telephone system completely dependent on the properties of its own lines only, and not on the properties of some line or lines not associated with the telephone system.

It is advisable in all cases, and usually absolutely necessary, to make a thorough inspection of the exposures before transposing the telephone circuits. Such inspections should

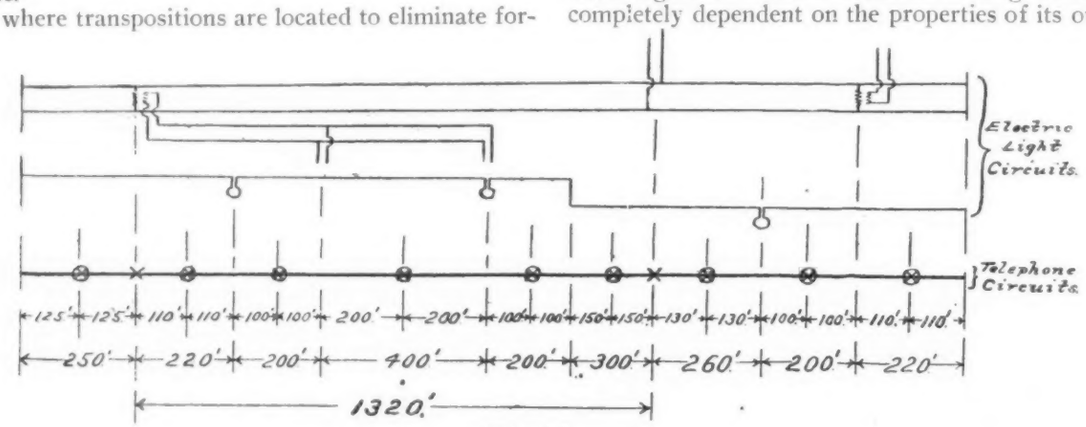


FIG. 11.

Method of transposition in cases of complicated exposure to electric light and power circuits, combining the methods of Figs. 9 and 10.

be made by men who understand electric light and power practice, as well as telephone practice.

Also it is advisable to make a few simple calculations of the probable values of induced currents and *E. M. F.* in the telephone circuits. These values will not be constant throughout a day of twenty-four hours unless the load on the disturbing system is likewise constant. These calculations may be made from the formula given above.

Experiments which have been made to determine the permissible current in a telephone receiver at commercial frequencies, which will not interfere with telephonic transmission, show that a current of approximately 5×10^{-6} ampere is permissible. This will vary slightly with the frequency of the disturbing current, its wave form and the sensitiveness of the telephone employed. The value given is a safe value in general practice.

The worst case of induction is probably that of a single wire arc-light line directly beneath or beside the telephone line. The cases which give comparatively little trouble are those of metallic alternating circuits at a distance of thirty-five or forty feet from the telephone line, such as would occur, for example, when the telephone line is on the opposite side of the street from an alternating current line. Such an exposure usually has to exceed a mile in length before it becomes serious.

An exposure to a single-wire arc-light line becomes serious for a length of only a few hundred feet, if the arc-light line is close to the telephone line.

In cases where the exposure is to such a complicated distributing network that transpositions occur so frequently, if laid out in accordance with the above rules, that they are impracticable, it is necessary to resort to the use of twisted pair insulated wire, aerial cable or electro-magnetically shielded conductors. Shielding the wires with a metal coating has been found effective in certain cases. This, practically, is the only thing to do with grounded telephone circuits, but it is injurious to the telephone transmission.

It will often be found that the disturbances from an alternating current system occur only at night or at certain stated intervals in the day, although twenty-four hours' service may be given on the disturbing system. This is usually conclusive evidence that the disturbance is electro-magnetic rather than electro-static, and the treatment outlined above may be modified in such a manner as to eliminate the magnetic induction, paying particular attention to points where the current changes in the disturbing line.

Where the induction is slight it is not always necessary to cut in all the transpositions which the foregoing theory shows to be necessary to secure complete silence. It is possible to calculate theoretically what shall be necessary. If it is inconvenient or inadvisable to spend the time for this, a complete system of transpositions may be laid out and part of them cut in experimentally until the disturbance is sufficiently reduced. This is more or less a cut and try method, and the best results will always be secured by a complete solution of the case before any work is done, and then securing the immediate installation of the complete system of transposition, without wasting time in experimental work, the results of which may be doubtful.

VIII.—Joint occupancy of lines with reference to high energy systems. High tension transmission and the question of protection.

It is not uncommon practice in the residential districts of towns and in suburbs to occupy a pole line jointly with electric light, power and telegraph wires.

The question of leakage is an extremely serious one and can be eliminated only by the best construction and efficient maintenance. Poor construction will completely vitiate the expected results from a perfect system of transpositions. Telephone wires should be securely tied in and insulated everywhere. The line should be thoroughly trimmed and wires should not be touching objects of any character at any point other than the standard insulators. The power and electric light wires should be well insulated, securely tied in and strung reasonably tight. Considerable slack in the power wires or electric light wires renders the transpositions less effective and also invites trouble on the power or electric light systems.

The practice of stringing the power wires or the electric light wires with the two wires of a pair as far apart as the cross-arm permits gives rise to the greatest induction in the telephone circuits. It is extremely advisable to have the power wires strung as close together as possible and as far from the telephone wires as possible. Power and telephone circuits should never be on the same cross-arm.

There is a difference of opinion as to whether the telephone wires should be above or below the power or light wires. This is a matter which can be determined, in general, only by local conditions. The line which is least likely to break or to get in trouble and on which the fewest changes will probably be made should be above the other line. As a rule telephone development probably takes place faster than power and light development, and there are usually more telephone circuits than circuits of other character; and in this case it is advisable to have the power and light circuits above the telephone circuits. In the reverse case it is vital that plenty of clearance should be left for the telephone linemen to reach their own wires without any hazard from the high-tension circuits.

When the voltage of the high-energy circuits reaches the vicinity of 5,000 it is probably inadvisable to occupy a line jointly with such circuits. The constant current alternating system of arc lights is not included in this. The voltage on these circuits sometimes reaches a total of 9,000 or 10,000, but this voltage exists only between the two sides of the circuit at the power house and the voltages met at intermediate points are never as high as this.

As to when a transmission line may be termed a high-tension line, probably the simplest definition of this is when bare wires are used, from the fact that ordinary line wire insulation is of no use. Such a line should never be occupied jointly with other lines; meaning by other lines low-energy telephone and telegraph systems.

When the voltage is 10,000 or above the pole lines should be well separated and the minimum distance between the butts of poles should be such that when the highest line falls toward the other line it will completely clear it.

Any construction which will permit a high-tension line to become crossed with a telephone or a telegraph line in the case of trouble or general breakdown is to be absolutely condemned.

The question of protection of telephone and telegraph lines at crossings with high-tension transmission lines may be treated as follows: Set two poles close together, one on either side of the lowest line; make these two poles so high that the greatest length of broken wire which can swing downward from the upper line will clear the lower line. String a guard screen of iron wire over the lower line as an additional protection.

High-tension lines are usually transmitting large amounts of energy and there is a power-house capacity behind them capable, usually, of supplying several thousand kilowatts. The extremely high tension in conjunction with the large amount of energy available renders electrical protection which may be provided on the telephone circuits or telegraph circuits usually wholly inadequate, and the danger of crosses with such lines is so great as to jeopardize human life and property.

Too much care can scarcely be taken in protecting the low-energy lines from the possibility of crosses with such high-energy, high-tension transmissions. There is no protective device in the market which will protect low-energy systems cheaply and effectively. Such apparatus may be possible, but it is probably cheaper to eliminate the condition

by spending no inconsiderable amount in making the line secure from the possibility of trouble from high-tension systems.

APPENDIX.

Capacity and inductance of a grounded circuit of No. 12 N. B. S. G., from formula 3 and 1. Wire (copper) weighs 173 pounds per mile. Diameter, 0.104 inch.

h. Feet.	Microfarads per Mile.	Henries per Mile.
10	0.01060	0.002796
20	0.009796	0.003019
30	0.009379	0.003149
40	0.009105	0.003242

Two grounded circuits of No. 12 N. B. S. G., at the same height and a foot apart. See formula 18, 19, 20 and 21.

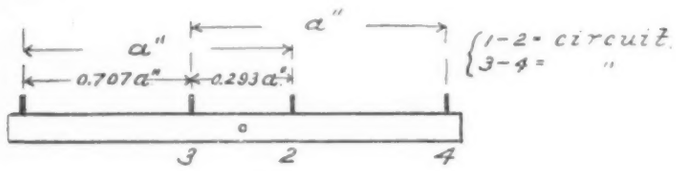
h. in Feet.	Self Capacity, in Microfarads.	Mutual Capacity, in Microfarads.	Self Inductance, in Henries.	Mutual Inductance, in Henries.
20	0.01171	0.004732	0.003019	0.001187
30	0.01150	0.004936	0.003149	0.001318

Increase of self capacity, due to the adjacent grounded circuit, is respectively 19.6 and 22.6 per cent.

Metallic circuits of No. 12 N. B. S. G. Capacity and inductance for various separations, from formula 4 and 2:

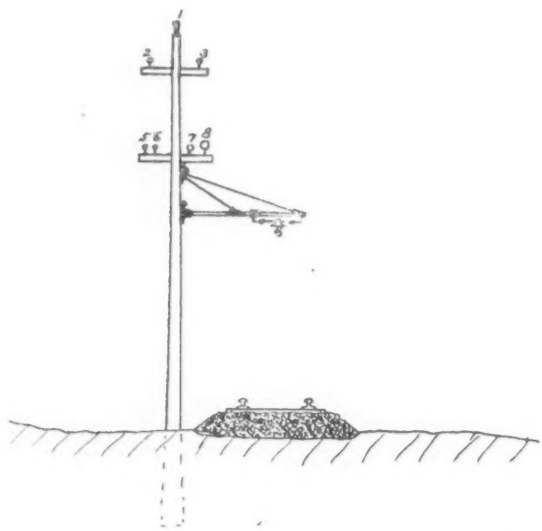
Separation, in Inches. d.	Capacity, in Microfarads per Mile.	Inductance, in Henries per Mile.
10	0.008503	0.003546
12	0.008218	0.003663
14	0.007992	0.003762
16	0.007806	0.003848
18	0.007649	0.003924

An arrangement of two metallic circuits, for no mutual induction; from formula 12.



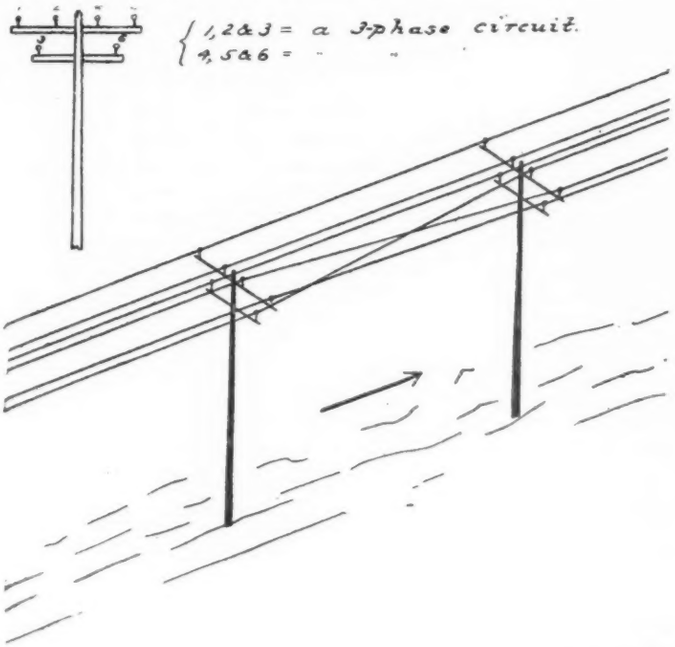
FORMULA NO. 12.

Applicable to a 4-wire, 2-circuit telephone line, or to a 2-phase, 4-wire power line.



High-tension, 3-phase transmission on wires 1, 2 and 3. Block signal circuit on wire 7. D. C. feeder on wire 8. Telephone circuit, wires 5 and 6.

Single track, long haul, electric railway service. Apply method of Fig. 11, in transposing 5 and 6; treat spirals, feed taps to trolley wire, signal boxes, turn-outs, junctions and telephone stations as discontinuities in the exposure of 5 and 6 to 1, 2, 3, 7, 8 and the trolley wire; transpose midway between two consecutive discontinuities throughout the distance of exposure.



TRANSPOSITION OF A THREE-PHASE LINE—A RIGHT-HAND SPIRAL OF ONE-THIRD REVOLUTION. SEE FIG. 6. COMMON HIGH-TENSION PRACTICE.

OPENING OF GRAND RAPIDS EXCHANGE.

On Saturday, January 9, at 12:30 p. m., the automatic telephone exchange, recently completed by the Automatic Electric Company for the Citizens' Telephone Company, Grand Rapids, Mich., began service. The change of five thousand subscribers was made in less than ten minutes; and immediately following the cut-over, the volume of business coming into the exchange was estimated by the management to be four times as great as that ever handled in the same length of time by the old equipment. This remarkable influx of calls lasted throughout the entire afternoon, and the automatic switches stood the test easily. At one time during the afternoon an examination of the connector switches showed that 1,500 telephones out of a total of 5,000 were busy at one time.

The adoption of the automatic apparatus by the Citizens' Telephone Company, Grand Rapids, Mich., will have an important bearing upon the telephone situation throughout this country. The Grand Rapids company has long been recognized as one of the most successful companies in the Independent field, and has recently declared the twenty-sixth quarterly dividend of two per cent. Beginning in a small way, in 1896, in Grand Rapids, the company has rapidly increased its business—not only in Grand Rapids, but throughout the adjacent territory. It has built a large number of exchanges, and has purchased others which have been added to its system. It now owns and operates 2,200 miles of metallic toll line circuits. The majority of these lines are built of copper, and it is the policy of the company to use nothing but copper in the construction of its toll lines in the future. The total number of telephones operated by the Citizens' Telephone Company—including Grand Rapids—is 15,490. The latest reports show that the automatic service is entirely satisfactory to subscribers, stockholders and the exchange management.

I hand you herewith my check for one dollar to pay another year's subscription for TELEPHONY, the best telephone journal published in the United States.—F. D. HUMMER.

Independent Telephony in New York

B. G. HUBBELL

B. G. HUBBELL.

The work of building Independent telephone systems in New York state in opposition to the Bell exchanges, has been active the past two or three years, and an immense amount of work has been accomplished. It would be hardly fair, however, to place the Independent telephone construction on the same comparative basis as that of the Bell company's construction, which has been extended over a period of twenty-five or thirty years.

The Independent companies have, however, taken advantage of the neglect of the Bell Telephone Company to furnish a comprehensive telephone service to the principal points in New York state, and these places are now permanently occupied with complete and comprehensive Independent systems, giving service to a list of subscribers far in excess of anything the Bell company ever dreamed was possible in these localities.

In nearly every instance the Bell company, according to its own admissions, has failed to grasp the situation as to necessities of adequate telephone service, and it has become a comparatively easy proposition for the Independent companies to take possession of the field.

The Independent telephone plants have been built on the latest improved plans, and are furnishing service so far superior to that of the Bell company that the public is fairly forced to abandon the use of the Bell company service, and take that of the local company. With capacities far in advance of the wildest dreams of their most enthusiastic supporters, the Independent companies are now being taxed to the utmost in taking care of the demands made upon them for telephone service. This growth has developed to such an extent as to make the Bell company a ridiculous farce in many sections of the country. That portion of the public, who were originally antagonistic to competing telephone service, because of the service of the two companies, are now outspoken in their compliments to the Independents for the advanced position they have taken in furnishing up-to-date service and in connecting them with the largest number of subscribers at reasonable prices.

In towns the size of Hornellsville, N. Y. (11,000 population), for instance, the Bell company operated for a period of twenty or twenty-five years with not more than 100 subscribers, for a large portion of that time. About the time the Independent company started in that city the Bell company had possibly 300 subscribers. The business man of Hornellsville was paying from $30 to $48 per annum, according to the style of service, for the privilege of talking to a comparatively few of his business associates and customers. To-day, after a little over two years' competition, the Independent company, at Hornellsville, is furnishing service to over 1,150 subscribers, and the business man, at that place, is now furnished, for the first time, a complete and comprehensive telephone service at a reasonable charge.

A merchant in Hornellsville may now have a telephone in his place of business, with over 1,200 subscribers to talk with, at less than the cost before competition when he had connection with but 200 subscribers.

The Bell company has a royalty to pay on every telephone it uses, and it further has an excessive capitalization on which interest must be paid to its bondholders. This capitalization has been brought about largely by the many changes that it was necessary to make in the Bell system while it was passing through the experimental stages. It is no discredit to the Bell organization that it has had to rebuild nearly all its telephone properties several times before it was able to produce a satisfactory service for the communities in which it operated. It is still confronted, even at this late day of the development of the telephonic art, with the necessity of rebuilding a large number of its plants in western and central New York.

All of these conditions mean, large expenditures of money, increase of capitalization, whether by sale or stock or bonds, and of necessity, increased revenues to provide for the interest charges on such increased capitalization.

The Independent companies building at a later date in the development of telephone art, have been able to provide themselves with the latest improvements at reduced costs and have not been subjected to the extreme expense of the experimental stage, nor are they subjected to the arduous task of providing revenues to take care, annually, of a heavy royalty on each telephone they have in service.

They are, therefore, with low capitalization, able to furnish telephone service at a cheaper rate than can be furnished by the Bell company.

There is, however, a peculiar condition existing in furnishing telephone service that exists in few other lines of business; that condition is, with increased number of subscribers, the cost of operation and maintenance of exchanges, per telephone is greatly increased. A person would naturally think that a large exchange could furnish service at a cheaper rate than a small exchange, but the actual conditions are directly contrary to that supposition, as, for instance, it costs less per telephone to operate an exchange of one hundred telephones, in a small village, than to operate one of one hundred telephones in a town of ten thousand inhabitants, and less per telephone to operate one thousand telephones in such a town than to operate ten thousand in a city like Buffalo, and on the same basis it costs less to operate ten thousand in Buffalo than it does one hundred thousand in New York. The basis of maintenance and operation is the cost of providing for and handling the messages going through an exchange. In Hornellsville, as an example, with the Bell company furnishing three hundred subscribers and the Hornellsville company eleven hundred subscribers, giving each subscriber the opportunity of calling every other subscriber in the respective systems, within a given period the Bell company would handle three hundred times three hundred, viz., ninety thousand messages, whereas the Independent company in the same period would handle eleven hundred times eleven hundred, viz., one million two hundred and ten thousand calls in the same period. The Independent company would have, on the same rate of charge, an income of about three and one-half times as

much as the Bell company would have, but it would perform over thirteen times as much labor in taking care of the necessities of its subscribers. It can, therefore, readily be seen that as the number of subscribers increase, the cost of maintenance and operation of telephone properties increase in far greater proportion.

No subscriber to a telephone system is going to object to a reasonable increase in the price of service, provided he is furnished with a corresponding increase in value received, by being furnished a continuous increase in numbers of telephones used with whom he may converse.

For the past eight years the Bell company has maintained a bureau of information, to gather statistics as to the growth and general condition of Independent telephone companies —their short-comings, failures, etc. In this time there have been over 6,500 Independent systems constructed in the United States, at a cost of over $200,000,000. This Bell information bureau has been able to find twenty-two companies out of this 6,500 Independent telephone companies that have had some financial reverses. Out of the twenty-two telephone companies mentioned as having met with financial misfortune, a majority of them have been reorganized by their loyal supporters, and placed on better financial conditions than ever, and are furnishing strenuous competition to the Bell company.

There is no better argument for the future success of the Independent telephone movement, financially and otherwise, than the argument of the Bell company, that twenty-two companies out of 6,500 have, at some time in their career, become financially embarrassed. During this same space of time there have been more than ten times this number of national bank failures. On the same process of argument the Bell company might contend that the national banking system is an entire failure. If it still has the welfare of the investing public at heart, as it claims to have, it might better confine its advertising space to criticisms of the national banking system and warnings to the possible investor of the danger in the securities of national banks.

The Bell company in some of its advertisements, further notes a list of nineteen companies, in various parts of the United States, that have been absorbed by it.

It is a well-known fact that the Bell company has met with such decided reverses in its competition with Independent companies, that in many places the only method in which it could maintain itself at these particular points, was by buying at fabulous prices, the controlling interests in these Independent companies. Its statement that it has been able to purchase but nineteen companies out of 6,500 companies in the United States, is a still further evidence of the stability, integrity, and loyalty of the Independent companies of the country to the cause they represent.

The Bell company fails to mention the stupendous failure of the Bell company of Michigan, the aggregate financial amount of which was, probably, a hundred times as great as the entire amount of all of the Independent companies that have failed in the United States in eight years. The Michigan Bell Telephone Company attempted to compete with the Independent companies by cutting prices and buying up Independent plants. Recently they found themselves unable to pay the interest on their bonds, and were forced into the hands of an assignee. This entire Bell plant, covering the state of Michigan, has recently been sold to the bondholders, and is not now controlled by the Bell company.

On the other hand the Independent companies, of Michigan, are universally prosperous and paying dividends on their securities.

The Independent telephone development of central and western New York dates over a period of about two and one-half to three years. In that short time it has developed a list of subscribers in excess of the numbers the Bell company has been able to gather together in the same territory during twenty-five to thirty years' growth.

The Independent companies are fitted with newer and more up-to-date apparatus, with great capacities, and being supported, as they are, by the most representative business men in the section in which they operate, they are presenting a competition to the Bell company that is almost amazing in its strength.

The marvelous growth of the Independent companies in these localities, is so great that the unprejudiced person can easily see the annihilation of the Bell company from active competition in western and central New York that has taken place in some sections of the western states, where competition has completely driven the Bell company from the field.

Statistics show that over ninety-five per cent of the telephone calls for toll service go within a radius of from seventy-five to eighty miles from the point of origination, and the Independent companies can now, through the long-distance connections that are afforded them by the lines of the Inter-Ocean Telephone and Telegraph Company, reach all important points in western and central New York and Pennsylvania, and furnish their subscribers with a more comprehensive toll service than has ever been offered them.

As far as the financial investment in Independent telephone companies is concerned, it is safe to say there is not an Independent company in central and western New York that is not to-day earning more than a fair interest on its investment, and many of these Independent companies are paying as high as ten per cent and some lines a larger percentage. Independent companies are, universally, honestly and conservatively organized, and none of them, in this section, have been built by promoters for sale. They are dealing in a staple commodity that is as necessary and as desirable as groceries, boots and shoes, or other necessities of life. They all have a demand for their product almost in excess of their ability to furnish it at prices satisfactory to their subscribers and with profits satisfactory to the investors.

The Bell company, on the other hand, has its capitalization represented largely by inadequate construction, and out of date apparatus, or has been obliged to rebuild its plants at great cost, or is confronted with the necessity of doing so. It has further the handicap of royalties to pay on each instrument it uses. It lacks a general local financial support so essential to make telephone companies a complete and satisfactory success, and above all this there is a general feeling of condemnation on the part of the public at large for the overbearing, unaccommodating, arrogant policies which have been pursued by the Bell company during its monopoly of the telephone business in the past twenty-five years.

The Independent telephone companies are uniformly financed by the best class of business men in their respective communities, and these companies are so operated as to be universally free from debt. They have such loyal support from the moneyed interests in their local surroundings as to be able to take care of the utmost demands on them for increased service.

The advantages to the public, in general, from competition in other lines of business, are such as to make an imperative demand on the part of the public for competition in the telephone business. There is no line of competitive business where this demand has been shown to be so great as in the telephone business. History does not show a parallel case where the public has taken up a new line of work so thoroughly and earnestly, and is supporting it so loyally as it is the Independent telephone business.

In many parts of the country, where the Bell company has been able to buy competing companies, the citizens have indignantly resented such combinations, and have organized mutual telephone companies, and again placed the Independent company in opposition to the Bell interests in their localities, and the new Independent companies have invariably prospered in a greater degree than their predecessors.

Telephone Convention Papers

TERMINAL CHARGES MADE TO TOLL LINE COMPANIES BY EXCHANGES.

HOW TO meet the question before us is something in which all who are watching the onward march of the Independent telephone movement are deeply interested. The fundamental thought upon which is based all of the argument hereinafter set forth in this paper is one which should be used by every business man at any and all times, and in any and all lines of business, whenever the question of remuneration for services is up for consideration, therefore, you will readily see that it is my desire to be practical and not to try and induce any one to employ a method in their telephone business which would be in discord with methods used in all other lines of business in the commercial world.

Whenever ones mind is turned in this direction, there are two business rules which immediately present themselves, namely; Get pay for what you do, and get what you pay for. You will readily see that for each and every one of us to take these rules and make them a part of the book of rules which apply in our business, and follow them out to the letter, we will at no time, do injury to our fellow men or to ourselves, therefore, I take the liberty to assume that each and every one of us will admit that these are safe rules to be governed by.

Let us go back to the first rule suggested, and study it carefully (Get pay for what you do). The main reason why this is a good business rule and one which is readily accepted by all is because it applies well both ways, and therefore works no hardship.

In applying this rule in determining the terminal charge to be made by exchanges to toll line companies, you will notice that it will be necessary for the exchange in order to know how much pay they should have must first determine how much work they have done, and in no way can they accurately know this except they check the business both in and out, and in doing, this they will be able at any and all times to render an itemized statement to the party that is indebted to them, and that statement your debtor in all sense of business justice is entitled to have, and further, in doing this, they will assist not only themselves, but the toll line company in keeping a correct account of the business transacted and in rendering a statement, will not only show the out business of the station, but will necessarily in order to get remuneration for all of their labor, show the in business, and this is absolutely necessary to the toll line company in order that they may fully and positively know that the point where the message come on to their line, be it at one of the town stations or at one where they enter anothers company's exchange has been properly checked.

I will not right here discuss the charge in dollars and cents but rather endeavor to prove conclusively the basis on which the charge should be made, after this is accomplished, it will be an easy matter for any exchange owner and any toll line owner to get together in a contract, which will be just to both.

In the method outlined you will see you are observing the ordinary rules applied to the every day transactions in the business world, with the itemized statement in hand the toll line company can easily determine as to the correctness of the indebtedness and in that way, peace and harmony reign supreme and the toll line company will have no displeasure in allowing the claim as presented to them, save clerical error and auditor's showing of business improperly checked.

In formulating this plan, one must fully appreciate the position they occupy in the Independent telephone field, for in a good many cases there are telephone companies that will in one case, be the exchange, and in another be the toll line company, so you will see that it is necessary to have a basis on which you calculate the terms and conditions in your contract which will in either case, treat you fairly, and by observing the rule, you will have this basis—Get pay for what you do.

In the second rule (Get what you pay for), we have the same protection. It is unnecessary to tell a telephone man to do this, as this principle seems to be adopted by all in the business; however, one should not be exacting to an unnecessary degree, as I have explained before, this rule also has to work both ways, and we at all times should be reasonable. Operators in exchanges that are operating toll lines for another company, should to a certain degree be under the control of the toll line company, at least as far as her work pertains to the toll line company's business exclusively, and the owners or managers of such exchanges in employing operators for these exchanges should be guided somewhat by the suggestions or the requirements of the toll line company, so that they will, to the fullest extent possible, be able to follow out the second rule (Get what you pay for).

I believe you all see the method clearly, and I will now make a statement as to the amount of the charge to be made, and in doing this, you again have to consider that most of you at least will be exchange owner on one contract and on another, the toll line owner, so that the charge must be, to be a correct one, on the basis of value received and my experience has taught me to believe that fifteen per cent. on the out business checked and collected for and ten per cent. on the in business checked properly is an equitable charge and one in which the exchange will enjoy a profit and one which the toll line company will feel able to pay.

In summing up the method I have outlined you have but a simple business transaction, and for the exchange to get its pay it has but to do the same as any other business man, present its claim in the form of an itemized statement, and the toll line company has but to do the same as any other business firm before passing credit, verify the correctness of the statement.

In the charge mentioned, I have not said anything about equipment and maintenance of same, but I feel that the percentage charge is sufficient so that the exchange could well afford, taking all things into consideration, to furnish the required circuits from the city limits to the switchboards, free of any further costs to the toll line company, and that they would be required to take care of the same inside of the city limits. In case there is any special equipment required, same should be supplied by the toll line company. I have at different times, heard the question discussed as to which party received the most benefits resulting from a toll line company connecting with an exchange, but so far as my experience goes, I feel that it is a mutual benefit, and that either party makes a mistake when it refuses to make a contract on the basis here outlined.

In determining this charge, I have endeavored to take into consideration, the value of the one to the other, and I believe if any one will take the time to figure out the amount of time and expense which has to be borne by the exchange and the benefits to the toll line company, derived by having conection with the exchange, they will readily see that the charge is approximately, if not exactly correct, and has taken into consideration, both parties, and that the charge is partial to neither exchange or toll line. Let us all be willing to earn our money, and be willing to earn it in the way outlined by those who pay us.

I have not mentioned frank business and through-switching as it does not necessarily come within my subject, but if you will permit me I will say a few words along this line. It is my belief that the percentage charge is sufficient that the exchange should check the frank business and not charge commission on same, or if that could not be agreed upon, the exchange should feel, and be properly remunerated if they receive fifteen per cent of the gross amount rceived by the toll line company in consideration for the frank. This class of business is fast being done away with, and perhaps the question will not have to receive consideration much longer. Connections should be made for through calls without further charge unless toll line company require station connecting calls through to make record of same; in that event, they should receive compensation. There are, at present, some other methods used in making this terminal charge. However, the one I have outlined is the one most popular at the present time. A few are using a flat rate of five cents per message, but surely not any one will say that this is the correct way of making the charge, or if this be correct, then our first rule is bad and we do not get pay for what we do; for there is no argument which will overthrow the fact that messages going through perhaps one, two, three, four, five different switches, and having a charge ranging from twenty cents to one dollar and upwards will all consume the same amount of the operators' time to put through. Consequently, there is no argument in favor of the flat terminal charge, except a lazy man at the exchange, who does not desire to do the work of adding the figures to ascertain the amount of business so that he might determine the amount of his commission on same. Just as sure as one should receive more sugar for one dollar than for fifty cents, just so sure one should receive and be willing to pay more commission on a one-dollar message than on a twenty-cent message.

It is not my desire to see a method employed which will not

fully compensate the exchanges for the labor performed, and I know that a five-cent charge on a one-dollar message is not sufficient compensation and I further know that a toll line company will not expect an exchange to handle a one-dollar message at this price. No one will dispute the fact that messages consume time in proportion to distance traveled and to the number of times switched.

In the method I have outlined you have the only equitable way for the exchange to determine this charge, and the only equitable way in which the toll line company will be satisfied with the charge.

The methods employed by some companies where they are both exchange and toll line owners should be no different than those employed by companies who own only the exchange or the toll line. In the cases where the parties connecting are owners of both, that have come under my observation, I have found that some of them do not charge either on a flat rate or a percentage basis, but simply take all there is and allow the other fellow, which in most cases is a different one, to do the same, but this is entirely unbusinesslike and unfair to all parties concerned.

There is one other condition which I wish to bring up in cases where the terminal of the toll line is in cities that are of sufficient size to warrant the expense to maintain its own office, and own toll line operator, of course, making arangements to connect with the exchange so that the Independent telephone patrons of such cities will have the benefit of the toll lines, and in that way the toll line company will be in a position to work up its business in that territory to its fullest capacity, and at the same time will, in no way, interfere with the business of the exchange. In cases where it would be advisable to maintain an office of this kind, it could in all probability be arranged that the toll line office would be in the same building with the exchange, and a contract could be easily arranged with the exchange to carry out the plan of maintaining your own toll line office separate and distinct, yet working together in harmony to the same end.

In conclusion, let me say I have endeavored to be brief, yet explanatory, and I fully realize that I am not able to touch on all sides of the subject, but I have endeavored to show the one practical method, and the one we all could use with perfect safety to our business; and I know that if the members of this association will fully discuss this question, that each and every one of us will go home feeling it was good to be here; and if we can decide in our own minds what is right, let us return to our respective homes and endeavor to carry it out ourselves and also endeavor to help our neighbor.—*Paper read by H. L. Green, Waterloo, at the Northeastern Iowa Telephone Convention, Dubuque, Iowa, Feb. 9, 1904.*

THE "CAUSE" IN WASHTENAW COUNTY.

The Washtenaw Home Telephone Company has undertaken to build up the entire county of Washtenaw, from which we get our name. In the county we have Ann Arbor, the largest city, with a population of 15,000. Then comes Ypsilanti, a hustling little place of about 10,000.

In the town of Chelsa we find an Independent company connected with the Bell, and the same condition prevails at Saline. We have invited both of these companies to join with us, but it appears that they wish us to build up the county except in their towns and then give them not only better service than they now have with their Bell connections but a larger percentage of tolls and more towns with which they can connect. It is out of the question for us to build up the county without entering into competition at the two towns of Chelsa and Saline. We propose to give them a reasonable time in which to join hands with us. If they fail to do so, then we are in for a fight which will be expensive for us both. We shall not fight unless necessary, but I assure you that both towns are going to have Independent exchanges.

We have three other towns—Dexter, Manchester and Milan. In Dexter we have the best of the situation and fully expect to close up the Bell exchange in that place. We have enough subscribers there to warrant the statement, and they come to us every day. In Manchester nothing has been done up to the present time. You all have connections with that point through the United States lines. We will take up the exchange proposition for that point some time this summer. At Milan the Monroe County Telephone Company of Dundee asked for a franchise, which was refused. In all justice, we shall give them ample time to build the town, but their failure to do so within a reasonable time shall be taken as an indication that they do not intend to thus open up the field to ourselves.

We are building copper toll lines, using No. 10 throughout the county from east to west and north to south. By April 1 we hope to provide a direct connection from Jackson and the southwest to Detroit and from the Livingston county lines to the south and southeast. We guarantee that any message sent over our lines will be perfect and we trust for your business and we hope you will route all you can via Washtenaw county.

We are erecting our own building in Ann Arbor and will do the same at Ypsilanti. A personal inspection by you can only give a proper idea of the completeness of our building and our work. Everything is the best that the market affords.

We sincerely ask that you help us all you can. We want you to see that the college boys who may go from your town are instructed to talk for us and refuse to use the Bell system. They are a big feature of our city and we want them with us.

I would like to see the Independent companies take up the question of advertising their toll connections. I can assure you that good advertising pays. You cannot make a better investment or get greater returns from a small sum of money.

I do not mean by this advertising in town and city directories and such publications. I mean newspapers, neatly printed cards, put everywhere, and possibly stickers, if pasted where the traveling public and others will see them. In other words, think a moment what you are advertising and how is best to do it. Most of you take one or more of the trade papers. The advertising in those papers should be the most attractive part to the manager and when he wants anything he should not in justice to the company he represents buy a dollar's worth of any material or apparatus without first writing to advertisers and obtain their prices and study for yourselves as to quality—take no man's word as to quality. Do not buy material just because the salesman is "a good fellow."

I buy thirty foot, six inch top poles for $170 delivered, as fine a lot as I ever saw. I learned the place through an advertisement. I am sure none of you beat that price for first class poles. The same condition prevails in all other materials—cross arms, pins, insulators, etc. I save my salary and more every month by answering advertisements and learning where to buy. I usually name the paper in which I saw the advertisement. Prejudice is a thief and is to-day robbing every man of many good things and dollars which will not come back.

Advertise what you have to offer and read the advertisement of what others have to offer. If this advice is followed out by every one of you, then you are worth more money to the company which you represent. I hope they will appreciate it, for in appreciation of the services performed by any one from the office boy to the manager is the secret of getting work out of an employe.

The Bell company, through the new organization, plans to again rob the people of millions. The Bell's only hope to make money out of the telephone business is by the sale of stocks and bonds. Block this game of the Bell selling $20,000,000 worth of stocks and bonds (when it cannot pay interest on $40,000,000) and it will have less money with which to carry on an underhanded fight. Advertise it for what it is.—*Extract from an address by Chas. F. Speed before the Michigan Telephone convention at Grand Rapids, February 25, 1904.*

PARTY LINES.

JOHN B. RHODES.

Few Independent telephone men will dispute that the phenomenal growth and development of Independent telephony has in a large measure been due to the fact that at the time of the early inception of competition in the telephone business, Bell service was rendered much more unsatisfactory than it might otherwise have been, by from sixty to eighty per cent of the subscribers being obliged, by reason of exorbitant rates for individual lines, to accept party line service.

Exclusive service, and the absence of party lines, were consequently among the most effective arguments in favor of Independent telephone systems. Not less important, however, were equitable and just treatment to all and a due regard for reasonable demands by the public.

The immense development of the past few years, and the consequent necessity of economizing cable and pole leads, together with an overwhelming demand from those who desired service and regarded the matter of price as of greater importance than the character of the service, rendered it necessary for Independent telephone men to seek some method by which every one could be supplied without reducing the price of individual service to an unprofitable figure.

We have observed the result of the serious mistake of the Bell company in trying to force upon the public ten party line and so called "kitchen" service, the use of which caused almost universal complaint. While this class of party line service was endured by many persons because of the low rates, the general public demanded something better.

The Bell company had four and eight party selective service, but the deplorable condition of its lines, and consequent inferior service, caused a prejudice against all party lines indiscriminately.

That the modern two and four party selective service, as furnished by Independent companies, is extremely popular is proven by the unexampled prosperity of the companies which have adopted it, and the inclination of the Bell people in some of these places to go into the grocery and plumbing business, establish laundry agencies, etc., in a fruitless endeavor to force the patrons engaged in these lines to retain telephone service.

While the installation of party lines will largely increase the responsibility of the managers and others engaged in the operating

field, and will force upon them the unpleasant duty of ameliorating many difficulties, which will be constantly arising among subscribers selfishly inclined, these difficulties, like prejudice against party line service, which until recently has been universally bad, will, if judiciously handled, be reduced to a minimum. Improved service will be a factor in attaining this result.

In this connection there is an extensive field for the thoughtful manager, who should carefully forecast the probable requirements of a prospective subscriber, giving due consideration to his business and social circumstances, ascertain the amount and nature of the service he will require, then group those between whom there is likely to be the least friction and interference. If this is wisely done it will meet the hearty approval and commendation of all subscribers, and will redound to the profit of the telephone company.

From the standpoint of a stockholder, the party line is desirable because it will reduce the unit cost of a growing volume of business, and increase about twofold the earning capacity of the money invested.

For a modern exchange of say two thousand subscribers the average cost of construction should not exceed $200 per individual line. If for such a plant the residence rate is $24 per year, the gross earnings would be twelve per cent of the same amount invested. By equipping such a line with four party service, the investment, including four instruments, should not exceed $230. If a rate of $15 is charged for four party service, the revenue would be equal to twenty-six per cent instead of twelve; but as a conservative estimate would place the average number of telephones on a line at three instead of four, this would doubtless in practice be reduced to something over twenty per cent.

Farm line development is a feature of party line service which has occupied considerable of the attention of most managers, and the customs by which this class of trade is handled are more numerous than the companies operating Independent exchanges.

How to arrive at a schedule of rates and regulations which will not restrict development, and at the same time yield to the owner a reasonable return for his investment, is a problem, the solution of which is attended by many difficulties.

Before the advent to Independent telephony, but a few years ago, demands for rural service were handled in a very uniform manner. A refusal by the Bell company to supply such service placed the question where it was not debatable; but so rapid has the development in rural districts taken place within the past five years that in Ohio alone the various Independent companies are furnishing service to nearly thirty-two thousand farmers in their homes. In some other states this class of development is even more extensive than in Ohio.

The rates for farm line service in Ohio usually range from $1 to $1.50 per month, which, considering the initial investment and the cost of maintenance, yields a smaller return to the stockholder than any other class of service. But for a distance of from five to ten miles from exchanges where troublemen are at all times available, the service can be profitably handled at these rates; but in most counties there are numerous residents in districts more remote who are equally anxious for service. Many of these districts are from fifteen to twenty-five miles from an exchange, which renders it very difficult and expensive to handle them. From the company's point of view, it would seem that a schedule of rates proportionate to distances should be established; but unfortunately for the company, the farmer in remote territory is not inclined to accept this solution.

It occurs to me that the most feasible method by which such business may be handled is to allow the farmers in such districts to construct and operate their own lines and provide some equitable arrangement for interchanging business with them.

If managers will interest themselves in such development they can usually govern not only the method of operating but the purchase of apparatus and the character of construction, which, if accomplished, will render the service almost, if not altogether, as reliable and satisfactory as that furnished by the telephone company.

When arrangements of this kind are made, the telephone company should own and operate the necessary switchboards and charge a switching fee that will be sufficient to defray all necessary expense and yield a reasonable return for the amount of capital invested.—*A paper read by John B. Rhodes, Zanesville, before the Ohio Independent Telephone Association, at Cincinnati, Ohio, February 19, 1904.*

IS THE TIME RIGHT FOR THREE MINUTE SERVICE?

At a meeting of this association, held in Lansing a year ago, I advised the adoption of the three minute schedule and a cheaper rate for messages after 6 p. m. Your attention is again called to the same subject, and you are urged to take some definite action on the matter before the close of this meeting. Toll messages at the present rate of one-half cent per mile for five minute conversations are not as profitable as they should be, and it has been suggested that the schedule of three-fifths cent per mile, which is the rate now in use in some of the neighboring states, should be adopted. My opinion is that an attempt to raise rates would be a serious mistake and that instead of increasing toll receipts it would result in a decrease because of the business that would be driven away.

The theory and practice of Independent telephony has always been to give service, both local and toll, at rates as low as are consistent with good business principles, and as long as we adhere to this theory and practice we can be certain that the public will support us and that our stockholders will be willing to leave the management of their interests in our hands.

The proper time limit of toll messages, and upon which toll rates should be based, is that period nearest to the length of time consumed by the average message, and yet it should not be of such brief duration that it is but a small factor when compared with the length of time consumed in scoring and getting ready to handle the message, as, for example, rates based on one minute service are not right because of the length of time in which the line is earning money, or the length of time the subscriber talks, is too short as compared with the time necessary to get both parties together ready for the conversation.

A careful study of several thousand messages shows that they average very close to three minutes. This being the case, we should figure on what would be the proper rate for the average, or three minute conversation, and let the subscriber who talks longer than the average, or overtime, pay an extra price for the privilege. When subscribers learn that three minutes is the limit instead of five they will condense their messages so as to conform with the time limit, and use as few unnecessary words as possible. In a short time it would be found that a great many more messages can be handled on a line in a given time than at present, thus increasing toll receipts without raising rates or driving away customers.

Over eighty per cent of the toll line business is handled between 6 a. m. and 6 p. m., and during the balance of the day the lines are practically idle and unprofitable. We should offer some inducement to subscribers to use the lines during these unprofitable hours, and the most feasible way to do so is by means of the so called "night rate"—that is, a cheaper rate for night business. The experience of other companies shows that the night rates do not in any way interfere with the regular day business and stimulates the use of the lines for social purposes. It takes the place frequently of letters and telegrams, and occasionally, but not often, a subscriber waits until after 6 p. m. with a business message to get the benefit of the cheaper rate. Their use of the line for social purposes develops the telephone habit, and as it grows we will find that not only are our lines made more profitable during the dull hours, but that people having gotten into the habit of depending on the telephone for outside communications, will use it more often during the business hours.

When these rules are adopted, and if they are not adopted now they most certainly will be some time in the future, they must be lived up to by every Independent company in the state, and every company represented here should pledge itself to do all in its power to make them operative. Our present conditions are absurd, and a new schedule not used by all, would make them more so. Some companies allow subscribers to talk as long as they wish to without any charge for overtime. Others adhere closely to the five minute schedule, while still others, especially those in the United States company's territory, use the three minute schedule. For instance, our Lansing messages over the United States company's lines are based on three minutes, and cheaper rates are allowed for night service, while messages over the Union company, the Livingston company or the Citizens Company's lines are for five minutes with no reduction for night service. At Jackson and other points the same conditions exist, and in still other exchanges are found the combinations mentioned above with the additional complication of rural toll lines running out twenty-five or thirty miles with no time limit whatever.

While we are discussing this subject something should be said regarding the necessity of more uniform rates for local and rural exchange service. It will undoubtedly be a difficult problem to obtain uniform rates where exchanges are already established, but we should get together on all new installations. Some of us believe that the lowest rate at which we can afford to install farm telephones is $15 a year, others say $12, others go as low as $9 and still others insist that the $12 rate should include not only the switching point but all other exchanges in the county.

Either a committee should be appointed authorized to investigate and plan a remedy for existing conditions or the secretary of this association should be instructed to give the matter a thorough investigation, and enough money raised to pay for his time and whatever expenses he may be put to. The writer has prepared a code of rules governing the handling of long distance business for the Citizens' Telephone Company of Grand Rapids. There is nothing new or remarkable in these rules, but they attempt to embody a uniform manner of handling the business. They try to impress upon operators and other employes the value of courtesy and conciseness, and explain as near as possible what seems to be the best way of handling the business. I believe these rules, or ones along the same line, should be adopted by every Independent company in the state. For the purpose of getting action on these matters I move the adoption of the following resolutions:

RESOLVED, that a committee of three be appointed by the chair to determine upon the proper time for the adoption of the three minute rate and night service with full power to act regarding details of what kind of messages should be affected by the night rate; and further

RESOLVED, that this committee draw up a code of rules governing the handling of long distance business, and that the secretary of this association be instructed to have these rules printed in book form, and issue same to the different companies forming this association in such quantities as they may desire, at a price slightly above actual cost.—*A paper read by C. E. Tarte before the Michigan Independent Telephone Association, Grand Rapids, February 25, 1904.*

NORTHWESTERN IOWA CONVENTION.

Nearly one hundred members attended the annual meeting of the Northwestern Iowa Independent Telephone Association meeting, held at Dubuque, Iowa, on February 9. The convention was an enthusiastic one and much good was accomplished. The program was as follows:

"Terminal Charges to Toll Line Companies by Exchanges," H. L. Greene, Waterloo. Discussion.

"Problems to Be Solved in the Future," C. P. Latta, Anamosa.

"What Are the Ear Marks of a Good Telephone Man?" Otto Borchert, Milwaukee, Wis.

"Are the Rates Now Charged by Independent Companies Remunerative, and Will They Continue to Be So?" W. G. Norman, Osage.

"Is There Anything New in the Farmer Situation?" F. E. Outing, Center Point.

Among the more prominent companies in attendance were:

Central Iowa Telephone Co., Iowa Falls; Buchanan County Telephone System, Independence; Gladbrook Telephone Co., Gladbrook; Home Telephone Co., Fairbank; Maquoketa Telephone Co., Maquoketa; Sumner Telephone Co., Sumner; Jones County Telephone Co., Anamosa; Dubuque Telephone Co., Dubuque; Standard Telephone Co., Dubuque; Linn County Telephone & Telegraph Co., Marion; Shell Rock Valley Telephone Co., Rockford; Vinton & Benton County Telephone Co., Vinton; Cedar Valley Telephone Co., Waterloo; Bellevue Telephone Co., Bellevue; Cedar Rapids & Marion Telephone Co., Cedar Rapids; Marshall Telephone Co., Marshalltown; Wettstein Telephone Construction Co., La Porte City; West Liberty Telephone Exchange, West Liberty; United States Telephone Co., Waterloo; Delaware County Telephone Co., Manchester.

TELEPHONIC RECORDS.

Apropos of the telephone and its uses, two recent cases fought out in the courts were based on disputes over verbal orders and contracts placed and received through the medium of that instrument. Unfortunately in this case, though sometimes the reverse, the telephone itself affords no written proof of the various business transactions carried out by its aid; in this respect it must yield the palm to its rival, the telegraph, the original written messages transmitted by the latter being retained by the authorities for a reasonable period. It cannot be too strongly urged upon all those who use the telephone in transacting important business, that a written confirmation of each message, to be sent by the next post is essential, if disputes, often involving considerable sums of money, are to be avoided.

In this connection, the writing telephone, invented by Signor Alessandro Cattani of Milan, promises to prove a blessing, if all that is claimed for it can be believed. It is stated to differ essentially from any other invention of like kind, to be based upon very simple scientific principles, and also to be readily applied to any telephone instrument. It should be pre-eminently suited for the reception of press news, which, by its aid, could be printed without the necessity for transcription, and also for business purposes where a permanent record of telephone messages is required. According to the Milan correspondent of the *Daily Mail,* which is responsible for the announcement, practical trials of the device are shortly to be made at Milan, the results of which, together with further details, will be awaited with interest. —*Electricity, London.*

A TELEPHONE PARROTT.

"Speaking of parrots," said Charles R. Rudd, of Muncie, Ind., "Pence, a conductor on the interurban line, has a pet parrot which came into his possession a few months ago. She came from Cuba and is a bird ot unusual beauty. Mr. and Mrs. Pence at once undertook to teach the bird to talk, and now Polly has a vocabulary of over 300 words.

"When Polly sneezes she at once informs the household that 'Polly's caught cold.' When the shades of night come on the parrot makes it known that she is tired and wants to go to bed.

"The bird's chief accomplishment is her ability to hear and talk over the telephone. Mr. Pence says that whenever the bell rings Polly shouts, 'Hello!' with as much clearness as an experienced operator.

"When Mrs. Pence holds the bird to the telephone when her husband is talking at the other end of the line the bird recognizes Pence's voice and cries:

"'Hello; come home to dinner.'

"When there is a knock at the door of the Pence home Polly calls, 'Come in!' and greets the visitor with the question, 'How's the folks?'

"The parrot has the freedom of the Pence house and goes from room to room at will. When Polly is scolded she retires to her perch and there assumes an air of injured innocence."—*Electrical Age.*

FREE TELEPHONE SERVICE IN CHICAGO.

Subscribers to the Illinois Telephone, the new automatic service in the downtown district, have received a pleasant, unusual and unexpected surprise. Official announcement was made by the Illinois Tunnel Company, successors to the telephone corporation, that all bills for past service will be wiped out and that service on the telephones now in use or to be put in will be free up to April 1, 1904.

This action wipes out bills or charges at the rate of five cents for every call made since the installation of the system. President Wheeler said in explanation of the announcement:

"We now have almost 5,000 telephones in use and are adding to the number daily. We want to educate the people in this business men's exchange to the great value of the service, and in order to get our subscribers and the public generally to use the telephone freely, we decided to wipe out the charges for all past service over our lines and continue the free service up to April 1, 1904. It is a change of policy inaugurated by the Illinois Tunnel Company, and I believe it is the first time anything of the kind was ever done by a public service corporation in this or any other country."

The officials of the fourteen Independent telephone companies in Henry County, Indiana, recently met in New Castle, for the purpose of perfecting an organization which will have for its purpose the general extension of county lines, mutual benefit and co-operation.

The underground system of telephony inaugurated by the military in Colombo, Ceylon, to connect the various batteries, offices and other military establishments in the town has just been completed. The work was begun in July and the final details have just been finished. The telephone exchange is at the military headquarters in Slave Island, and the underground wires have been laid to the military hospital and quarters on Galle Face, the Galle Face and Mutwal batteries, the batteries at the root of the breakwater, the conning tower in Flagstaff street, military barracks, etc., etc.

Commercial Aspect of the Automatic

FRANZ J. DOMMERQUE

F. J. DOMMERQUE.

The question as to whether an operator shall connect two subscribers desiring to converse with each other, or whether this operator shall be eliminated and in her place provided an automatic device at a central station by which the subscribers can make their own connections, is an important one at the present time. It is important not only to the telephone engineer and such parties as are financially interested in telephone work, but also to the subscribers themselves, which means to the general public, because the introduction of automatic telephone exchanges involves not only different apparatus, but also different manipulation of the telephone instrument by the subscriber.

The description of automatic apparatus does not come within the scope of this paper, but a review in minimum space of the present status of automatic exchange work may be useful to many of those who are not familiar with the subject.

The idea of connecting subscribers automatically is not new, as such a scheme was patented twenty-five years ago by Conolly and McTighe, although not put into commercial operation until the company owning the Strowger patents put the system on the market. The Strowger system is the best known automatic system at present. It consists principally in an assembly of automatic switches, each switch having ten horizontal rows of ten contacts each, there being at least as many switches as lines; all switches being interlaced so that a subscriber can set up the combination which connects him with the desired party, by picking out the proper line connections which are multiplied through the switches. In reality, the Strowger automatic system is nothing more than an automatic multiple system; the precise manner in which the lines are multipled does not concern us.

With 100 or less subscribers one switch per line is sufficient. Above 100 subscribers additional switches are required and then the switches are subdivided into connector and selector switches. There is one switch to every subscriber which takes care of the last two figures in his number, while for the third last figure connector switches are provided corresponding to pairs of cords in the manual system. If there are more than a thousand subscribers the selector switches are again subdivided into first and second selector switches and so on.

The idea I want to convey is that the Strowger automatic system corresponds in its make-up to a manual multiple system in which the operator is replaced by a mechanical device consisting of a rod which resolves the vector motion of the operator's arm into its two vertical and horizontal components, each motion of the rod being controlled by a relay, which relays are operated by the subscriber by means of a dial, the one relay *lifting* the rod a notch for each figure upon the dial, and the other relay *rotating* it a notch for each figure, the combination of the two motions securing the connection of two subscriber's lines in an exchange in which none of the subscriber's numbers contains more or less than two figures; with more than two, additional switches are brought into play.

Another automatic which is greatly advertised just now is the Faller system. The principle of this system is entirely different from the Strowger, inasmuch as it does not correspond to the manual multiple. It follows more closely the manual transfer or express system; a class of telephone systems little used at the present time; the present Bell system at San Francisco being one of this type. This manual system was experimented with for a number of years, as it does not require costly multiple jacks, and therefore promised to lessen the first cost of installation. It was found to be unpractical, however, as it led to too great complications for the requirements of quick service. In order to understand the difficulties in handling calls in a transfer system when the number of subscribers is comparatively large, say more than a thousand, and when the number of calls is great as it is found to be the case in the business districts of large cities, I will cite the operations which are performed in a manual transfer board developed to the highest degree in speed of operation and requiring the most intelligent operators.

In a transfer system the switchboard is divided into two parts, an A-board and a B-board. The combined work of the A and B operators is required to complete a call in the following manner:

B operator observes subscriber's signal.
B operator inserts answering plug in subscriber's jack extending subscriber's line signal to all A-boards; also lights lamp on placing cord at the first A operator's position that is not busy.
A operator inserts answering plug in jack under extended line signal and thereby extinguishes line lamp.
A operator pushes listening key, cutting out placing cord lamp.
A operator receives order.
A operator inserts connecting plug in any disengaged out-trunk jack, multiplied on trunks to section in which called-for subscriber is located (either in B-board of the *same* office or in B-board of *another* office), lighting all guard lamps on this trunk to indicate that the trunk is busy.
A operator presses key lighting calling lamp as the chosen trunk line on B-board.
B operator presses listening key or trunk, giving thereby a click in A operator's ear, indicating that she has cut in and is ready to take order.
A operator gives order over trunk.
B operator inserts trunk plug in subscriber's jack.
B operator pushes automatic ringing key.
A operator receives disconnect signal from calling subscriber.
A operator withdraws answering plug and lights disconnect lamp on trunk cord at B-board.
B operator observes this signal and disconnects.
All incoming trunk calls are handled by a B operator with assistance.

Mr. Faller attempted to construct an automatic system in which the principle of transfer switchboards should be retained, intending that the functions of the *human* operator to be executed by a *mechanical* operator. He has perfected a "mechanical operator" for a hundred lines, combining in one piece of machinery the functions of the A and B operator. For more than 100 lines some new piece of machinery will have to be introduced, and, as far as I know, this additional piece has not yet been completed. Furthermore, to my knowledge, no automatic board of the Faller type is in service, with the exception of a model in New York.

In referring to the Lorimer automatic telephone system, a few of the distinct features may be mentioned. In this system the number of automatic switches is reduced, and only enough automatic apparatus is provided for connecting

the telephones that are to be engaged in conversation at any one time. This arrangement is similar in this respect to the manual system. The manufacturer states that "this system consists in brief of a telephone and automatic transmitting device at the station of each subscriber; of automatic connecting apparatus at the exchange which is devoted to the common use of all the subscribers; of two wires between each telephone and the exchange; of a *common return wire* to which all telephones and the exchange are joined." The apparatus appears to be rather complex.

There are other automatic systems in existence, though most of them exist only on paper, and are not yet adapted to exchange work.

The first requisite of any telephone system, whether automatic or manual, is that it must furnish means for talking. Now all systems do this to a greater or less extent—I mean the conversation is more or less satisfactory. The advocates of the Faller system point out the circumstance that they can use common battery for talking as an advantage over other automatic systems, while the advocates of the Strowger system do not seem to agree to this and think that local battery transmission is superior to common battery so far as efficiency is concerned. It is well known that local battery transmission is more efficient than common battery transmission for a very short period, or at the beginning of a conversation, but with increasing duration of conversation the efficiency of the local battery transmission decreases, while with common battery the efficiency, though somewhat lower at the beginning, remains constant and therefore is higher than the total efficiency of local battery transmission.

Aside from the efficiency common battery is preferable for commercial reasons. It is fair to say, and experience will bear out the statement, that in all cases the cost of maintenance of a subscriber's station with local battery exceeds the cost of maintenance of a common battery subscriber's station by at least $1.50 per annum, not taking into consideration the annoyance caused by the repeated visits of the inspector to the subscriber's premises for battery renewals, etc.

Every telephone manufacturer has long ago found out that a satisfactory local battery transmitter can be designed and manufactured at less cost than a common battery transmitter, because almost any transmitter, however crude will talk with local battery, while the design of a really good common battery transmitter is an art; therefore, the use of common battery transmitters may be prohibitive in some automatic systems because the rest of the machinery and the circuits do not permit of the margin between rough and ready local battery transmitters and scientific common battery transmitters.

While discussing transmission it may be well to call attention to a serious error in all present automatic systems. It seems to me that all inventors of automatic apparatus have had in mind as their first object the invention of automatic apparatus to do away with operators, and have neglected to give the talking requirements due consideration in the first stages of their work, and have allowed the transmission of speech to take care of itself. The first and most important requisite in telephony is satisfactory talking, and it would seem proper that the inventors of automatic systems should go about it the reverse from what they have done, namely: they should first consider the requirements of a good talking circuit and then introduce automatic features which will not deteriorate the standard of transmission.

The principle requirement, therefore, to render an automatic system commercial, is the provision of a good talking circuit with a minimum number of contacts and coils and common battery as the source of current for transmitters and signaling devices. The latter perquisite is binding for all exchanges excepting very small ones, where the first cost of the power plant may be prohibitive. But in such small exchanges automatic service is not commercial for the following reasons: First, in small communities the telephone operator constitutes the information bureau and the public has become so used to this convenience that its departure would be greatly resented. Second, in small plants it has become the custom to build long lines reaching far out into the country and to connect a dozen or more subscribers to one line of this kind. In this manner service can be given to farmers, for instance, at a reasonable cost. If an individual line had to be provided for each one of the subscribers, the expense would either be too great or cheap construction would have to be used, the consequence of which would be extremely poor service and a high maintenance account. Third, in small exchanges, the first cost of an automatic installation for switchboard and subscribers' station is from 50 to 100 per cent greater than the first cost of the corresponding manual apparatus. Fourth, an operator must be employed in most cases to take care of the toll and long distance business, which, in a small place, is not sufficient to keep an operator busy, hence it is customary for one operator to handle both local and toll business.

Our further discussion will, therefore, apply to larger exchanges only, small exchanges being out of the race entirely. It should be understood that this paper is confined to exchange work; house systems or intercommunicating systems being excluded; but even for such purposes the automatic service has its objections.

In large exchanges the prospects for automatic apparatus widens. With manual switchboards the salaries of the operators form a large part of the annual expense. Doing away with operators would be most advantageous and desirable, and if it could be accomplished without increasing the total annual expense nor deteriorating the service, the automatic system would have fulfilled its mission.

As good and reliable service is the prime requisite, we will pay attention to service first. In the present available automatic systems the subscriber has to do his own operating, and therefore carries the responsibility for good operating to a great extent himself. If he is a good operator he may give good service, but as a rule the operator at the manual board is the better operator. Trials on both sides have shown that with an automatic system the service is no better than with a manual system, as the delay is not caused so much by the exchange operator as by the subscriber in not answering promptly, which is bound to occur in either system; the time which the operator takes in making a connection is but a few seconds and can be accomplished in just as short a period of time as the automatic subscriber can work the dial of his instrument. Therefore, as far as speed is concerned, the automatic and the manual systems are commercially on a par.

In the last few years the manufacturers of manual systems and their engineers have put all their efforts upon simplifying their apparatus and to-day the subscriber's station of a manual common battery relay exchange is so simple that there is little left to get out of order. It is also most easily operated; all that the subscriber has to do in order to signal the exchange is to lift the receiver from the hook and when conversation is finished the disconnect signal is given by simply replacing it. At the exchange proper everything is centralized and standardized; the apparatus is substantial, simple and of positive action; the wear and tear is reduced to a minimum. The renewal of lamps is reduced to almost nothing. Consequently, the possibility of manual apparatus failing to give reliable service is very remote.

Any automatic apparatus must necessarily be more complicated than manual apparatus and the chances for trouble greater. When an operator gets sick her place is immediately filled by another operator; when an automatic switchboard gets sick, there is trouble.

To go a step further into detail, let us consider the method

of signaling. In the principle automatic systems so far developed, a ground is required at the subscriber's station for the purpose of signaling or, better expressed, for setting the combination. In a modern manual system no such ground is necessary. All efforts have been concentrated in manual systems to designing signaling circuits that would operate without a ground; the ground being recognized as a sworn enemy to reliability, especially in cities where electric railways ramify in all directions. In the days when grounded signaling was in vogue with manual systems, the advent of electric railroads forced the telephone company to either run a common return back to the exchange or connect the subscribers to ground in bunches so as to equalize the differences of ground potential in different localities.

Automatic systems with grounded circuits will have the same experience and the remedy will cost at least $1.50 per subscriber.

Automatic switches contain a great number of contacts in the talking circuit and even if these contacts are all platinum, they are not desirable, as they are expensive and liable to get out of alignment and become weak. It is none too easy to design an automatic talking circuit as well balanced, free from retardation, induction, etc., as the talking circuit of a manually operated exchange of a late date.

The question of annual expense remains now to be considered. There is no necessity of investigating the total annual expense, but only such items in which the manual and the automatic systems differ.

Under the item of interest and depreciation on a plant, we need consider the wire plant only as far as the above mentioned return ground is involved. The exchange apparatus and subscribers' stations should be taken into account, as they are necessarily more complicated in the automatic exchange and therefore should demand a higher figure for depreciation, but for the sake of argument the same percentage may be conceded to the automatic system as to modern manually operated plants, where depreciation at seven and one-half per cent and interest at five per cent are certainly not any too high.

Figures tell, as the story goes, therefore I will take a fixed example and calculate the difference in annual expense, omitting all items that are common to both systems. Assuming an exchange to be equipped for 5,000 subscribers, the first item to be determined is the cost of the plant. The figures in the following example are taken from my actual experience and may be changed to suit the experience of others. The first cost of a manual switchboard of the latest common battery relay type equipped for 5,000 lines, including power plant, amounts to $16.00 per subscribers' line and as a common battery subscriber's instrument costs about $8.75, a manual switchboard installed with subscriber's instruments will cost $24.75 per subscriber. Assuming that a certain amount of desks will be used, the cost per subscriber may be taken as $25.00.

The cost of an automatic Strowger switchboard and subscriber's station is $35.00 per line. Adding to this the cost of installation and other items to bring the automatic equipment on an equal footing with the above manual equipment, the first cost per subscriber's line will amount to $38.50, or $13.50 more than in the manual system. Hence the total first cost of the automatic board and instruments exceeds the total cost of the manual board by $67,500.00. Twelve and one-half per cent interest and depreciation on this sum amounts to $8,437.00. The rate of insurance will be at least one per cent which would add $675.00. If grounded signaling is used in the automatic system at $1.50 per line or $7,500.00, total must be added to the first cost. Assuming interest at five per cent and depreciation at three per cent on the common return, the annual expenditure for the common return wire would be $600.00.

If local battery is used for talking, $1.50 should be added to the annual expense per line or a total of $7,500.00.

The above calculated expenses must be offset by the saving in salaries of operators in the automatic exchange.

The number of operators required depends upon the business transacted in the exchange and on the number of calls an operator can handle. Assuming that the subscribers call on an average twelve times per day, we would have $12 \times 5{,}000 = 60{,}000$ calls per day. In a modern common battery system with double lamp supervision an operator can handle at least 1,750 calls daily, therefore, $60{,}000 \div 1{,}750 = 35$ operators would be required for a 5,000 line manual board. These would be day operators; in addition about fourteen night operators would be required, five day relief operators and three night relief operators, making a total of fifty-seven operators. Assuming the operators are paid on the average $20.00 per month, the total amount paid out per year would be $13,680.00.

In the above no chief operator, monitors or switchboard trouble men are included. One chief operator, two monitors and two switchboard trouble men are necessary, requiring an expenditure of $2,400.00 per year for salaries. In the automatic system five switchboard trouble men are required according to the statement of the Strowger automatic people; these attendants would each command a salary of at least $75.00 per month, making a total outlay of $4,500.00 per year.

For toll and long distance service the automatic exchange, like the manual, requires operators. On account of these operators the automatic exchange requires retiring rooms, lavatories, lockers, etc., and the building must be lighted and heated. From what I have seen, it is my opinion that no saving in floor space is possible in the automatic system.

Summing up, we find $\$17{,}212 - \$11{,}580 = \$5{,}632.00$ in favor of the manual system against the Strowger automatic system. In other automatic systems the results may be different, but in any case the saving in operator's salaries is offset by the increased expenditure for other items. However, there are other commercial features in the manual system, not easily obtained with the present automatic systems, the value of which may be calculated in dollars and cents. They need only to be mentioned to show their importance.

First of all, there is a possibility in manual systems of decreasing considerably the line expense, which forms the principle item, by the introduction of party line service. Where the number of calls per subscriber per day is small, as is generally the case in residence districts, more than one subscriber can use the same line, and by doing so, the expense per subscriber on such lines and consequently the amount that should be exacted from him as subscription, can be reduced with the beneficial result that the telephone can be placed within the reach of a greater part of the community. Party line service has been perfected so that the ringing is selective, which means that only the desired party is rung, leaving all other telephones on the same line undisturbed; common battery can be used for talking, in fact, the party line arrangement has no bearing on the talking circuit whatever; no ground connections are required at the subscriber's stations; in short, all the benefits of the most modern manual system can be extended to the party line subscriber. Of course, when one party on the line is talking, the other parties cannot talk, but, as stated above, party lines are not meant for busy subscribers. In case of subscribers who use the telephone only three or four times a day, it will be an extremely rare occurrence that two subscribers want to use the line at the same time. As far as the listening in on the line by third parties is concerned, such a thing is possible, though there are so-called lockout devices in existence. However, experience has shown that there is no need of them, if the number of parties on the line is kept within reasonable limits, as only the called subscribers receives the calling signal and any other party on the line, who wished to listen in, would have to stand with the receiver in his hand all the time so as to catch the other

party talking. I think that in city systems, not more than four parties should be put on a line. In rural systems, where the telephone is not used more than probably once a day and where the lines are mostly of great length, the number may be increased considerably, as stated before. Therefore, automatic systems like the Strowger limit the number of subscribers that can be given service to the ones that can afford to pay for single line service. Wherever an automatic system without party line service has to compete with a manual system in the same city, the automatic system is seriously handicapped, because of the party line question.

Another important factor in the modern manual service is the pay station. Pay stations not only are a great convenience to the public but are a good revenue producer for the telephone company. So far, the companies giving automatic service have not been able to arrange for pay station service.

So much about the commercial value of the automatic exchange in relation to the manual exchange. Assuming now that we have an automatic system which was equal in workmanship and commercial efficiency to the manual system, would it be beneficial? It would if we were sure in the first instance that the manual system had attained its highest degree of perfection. It must not be lost sight of that the manual system is very flexible, by which is meant that the parts constituting a manual switchboard, bear such a relation to each other, that other parts can easily be substituted without interfering with the other parts or with the service. We have many cases on record in which a switchboard has been given the benefit of a new invention at comparatively little cost. For instance, switchboards that originally were built with single drop supervision have been changed to double lamp supervision without great cost or interruption of service. In an automatic system, where the interdependence of the apparatus must necessarily be more significant, such an alteration would be very difficult if not impossible. In large cities it is necessary to have all offices belonging to the same telephone company, either manual or automatic, as the connection between manual and automatic offices would not give satisfactory service, such a connection being only feasible with toll and long distance service, where the calls are not so numerous. To change the offices in a city to automatic would be very expensive, as they are never equally old, new ones having been added from time to time with increase in the population, expansion of city and progressing civilization. In smaller cities and villages there would be an opening for a change when the old switchboard had given out; but even then, a change would not be economical, as there would be a great number of practically new subscriber's instruments that would have to be discarded. In a case of the formation of a new company there is a possibility of success. But where is there an opportunity to start in fresh, except in countries like Turkey or China? In this country, a general change to automatic would mean the establishment of a second system in each city or town where a manual system already exists. We are now treading on dangerous ground. Some time ago it was a subject of ridicule to speak of two telephone systems in one and the same place. As it looks to-day, the idea is not so ridiculous after all, as in many cities, towns and villages of this country we see two systems operating successfully. How long it will last and what the final result will be is hard to tell.

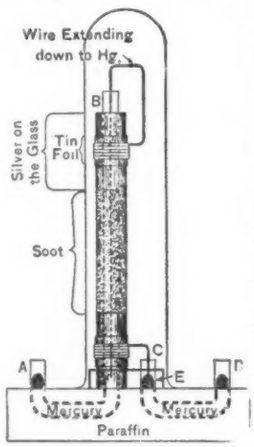
In our existing manual systems the specifications frequently speak of automatic functions, as for instance the signaling by means of lifting the telephone off the hook is termed automatic signaling. In some trunking circuits the ringing is done automatically. From these instances it appears that the designers of manual apparatus are alive to the subject and there is no reason whatever to believe that they will stop at that.

Retrospecting now, we must come to the conclusion that the telephone is not exempted from the general order of things, and that the best and quickest way to develop the art of telephony is to build upon the present foundation and substitute automatic operations in the manual exchanges, wherever time and money in operating can be saved without sacrificing any of the good qualities already existing.

METHOD OF MOUNTING CARBON RESISTANCES

Longden has shown how to make a fairly satisfactory high resistance by depositing soot on a plate of glass whose ends had previously been silvered with a wedge-shaped film. A modification of this, which can be very conveniently mounted, is illustrated in the accompanying figure.

A tube of glass is substituted for the plate. The ends after being silvered are snugly wrapped with a ribbon of stout tin foil, which is firmly bound on with copper wire so as to make good contact with the silver. Then the soot is deposited and hardened as described by Longden. To mount the resistance thus prepared, a J-shaped glass tube *AB* and a shorter U-shaped one *CD* are fastened vertically into a block of paraffin as indicated. The lower portions of these tubes are filled with mercury. The resistance tube is simply slipped over the long arm *B* of the J-tube and the end of the wire binding the tin foil at the top is carried down through *B* until it makes contact with the mercury; the end of the wire at the bottom dips into the mercury in *C*. The soot coating is protected by covering with the large test-tube, which is prevented from slipping about by means of the slightly smaller glass ring *E* fastened to the paraffin. *A* and *D* form the terminals.



A block of wood or paraffin, into which are fastened vertically a number of glass tubes, can be conveniently used for storing a series of resistances of various magnitudes, so that when one is wanted, all that is necessary is to transfer it from the rack to the mounting.—*Physical Review.*

TELEPHONES UP TO DATE.

"Talk about this fad of having a telephone in your house," said a Philadelphia physician the other day, "why the minute I receive a message that a patient is ill, I find their telephone a source of great convenience, for I send them word that way what prescription to take."

"But," interrupted a bystander, "how do you always secure the right number?"

"Oh, that's easy," replied the P. P. "As soon as I know the disease I immediately know the telephone number."

"Remarkable!" said his listener.

"'Tis so," he answered. "The other day I received word that a lady patient had cholera morbus, and I knew at once that her telephone number was 8-1-2 Green."

"That's nothing," said the New York captain of police, standing by. "We had an experience of that kind lately of the same character. Two bears escaped from a circus into the woods of Harlem, and a Chinaman getting into their clutches was soon an easy meal. A hurry-up call was sent in, but someone lost the number of the district where the call came from, but, coming to me, I told them at once as soon as they rehearsed the circumstances."

"Why, that is curious," said the P. P., "what was the number?"

"It was 2-8-1 John," retorted the Captain.

Wind Pressure on Aerial Lines

F. W. JONES

It is a foregone conclusion among far-sighted telephone and telegraph managers, that economy of construction and maintenance, and a maximum traffic value with a minimum interruption of wires, can only be secured by the observation of advanced engineering rules, and the transfer of the erection and care of telephone and telegraph systems from the hands of empirics, to the hands of competent engineers, both mechanical and electrical.

In view of the great obstacles that exist to the economical and proper maintenance of lines in this country, it may be that engineers cannot at present do all that would be possible under favorable conditions, yet, the greater the difficulties, the more necessary is the trained directing mind. It is at once a serious and grotesque situation when private corporations investing capital and employing a very high grade of skill to perform a public service so indispensable to the whole country, should be legislated against and heavily taxed in every state in the Union, held to strict account by every court, frequently mulcted in enormous damages for errors that cannot be avoided, and denied by cities, towns and villages, a reasonably free and unobstructed use of the highways for wires which are daily necessarily multiplying in number to meet the public wants, so that it really seems that the telephone and telegraph, the two greatest friends of our commercial and social life, not only do not receive a solitary bit of encouragement, neither municipal, state nor federal, but are taxed, hampered and thwarted to the point of desperation, while at the same time, the government and the public are becoming daily more imperious in their demands for the lowest rates and the best service.

Highways are filled with trolley and electric light poles and ornamental trees. Railways are crowding out such lines of poles as they have been able to accommodate in the past, to make room for more tracks, and the long-distance underground problem is so vast, both from financial, electrical and engineering considerations that it staggers the telephone and telegraph managers.

One of the first things to be considered is the effect upon poles and wires of the wind which, next to decay, is the cause of a large per cent of interruption, delay of messages, and expense, the latter including the wages of idle operators and clerks, besides cost of repair.

There has been no uniform agreement among those in charge of line construction as to the force exerted against cylindrical poles and wires by the wind.

Professor S. P. Langley, who stands very high as an authority, states that the resistance experienced by a plane surface exposed normally to wind blowing at various velocities, may be calculated from the following formula:

R, resistance in pounds = K A V^2.

K, constant found by experiment = 0.00166.

A = area in square feet of one side of the plane.

V = velocity in feet per second.

Professor Langley states that the resistance encountered by a cylinder in wind normal to its side, is one-half the resistance which would be encountered by a plane exposing an area equal to its longitudinal section, but that account should be taken of the fact that small wires, cords, ropes, etc., have been found by experiment to cause a resistance of from five to ten times what would be calculated, as per above formula, from their normal sections.

In England, Mr. John Gavey, the engineer-in-chief of the British telegraphs, calculates the strength of the average structures and wires to withstand, at right angles to the wind's direction, a pressure of seventeen pounds per square foot, and takes two-thirds of the diameter into the length of the round poles and conductors as the approximate area affected. The British table of wind pressure requires a velocity of sixty miles per hour to equal seventeen pounds per square foot. Whereas, the following table furnished by Prof. C. F. Marvin of the United States Weather Bureau, shows that the wind requires a velocity of eighty-five miles to equal seventeen pounds:

TABLE OF WIND PRESSURES.

Wind Velocity Miles per hour.	U. S. Weather Bureau Lbs. per square foot.	British Table. Lbs. per square foot.	Prof. Langley's Lbs. per square foot.
20	1.27	1.97	1.42
30	2.64	4.42	4.21
40	4.44	7.87	5.71
50	6.66	12.3	8.92
60	9.22	17.7	12.85
70	12.2	24.1	17.50
80	15.5	31.4	22.85
90	19.2	40.	28.92

Oldbury Burne of the Indian Government Telegraphs, Calcutta, states that experiments he made by swinging a plate of 12″ by 6″ and a cylinder of 4″ diameter, both of exactly equal weight, and lengthening the extensible cylinder until both plate and cylinder attained the same amplitude of swing, giving the length of cylinder equivalent to the plate between 33 and 35 inches. Area of one side of plate 72 inches, and area of section of cylinder 33″ by 4″ = 132 inches and 35″ by 4″ = 140″, former giving 2 ÷ 3.67 and latter 2 ÷ 3.89 or .545 and .515. In India two-thirds of the diameter multiplied by length is used to calculate the wind pressure area of poles and wires.

WIND SURFACE OF ONE MILE OF WIRE.

B. W. Gauge No.	Diameter inch	Area of 2/3 of diameter in feet	B. & S. Gauge No.	Diameter inch	Area of 2/3 of diameter in feet
4	.238	69.8	7¼	.138	40.5
6	.203	59.5	9	.114	33.4
8	.165	48.4	10	.102	29.9
9	.148	43.4	12	.08	23.8

Kernot, of Melbourne, demonstrated by experiment with heavy air blasts that the pressure at right angles on a cylinder was about one-half on a flat surface of equal diameter, and that the pressure on one side of a cube was only .9 of that of a thin plate of equal area.

Telegraph structures and wires must be designed not only to withstand the maximum ordinary wind pressures to which they may be subject, but also to resist the sudden gusts which are far more destructive than a steady high wind velocity. The extra weight and wind surface of clinging sleets and snows to poles, arms and wires, and the areas offered by pins and cross arms to the wind must not be overlooked.

WIND SURFACE OF POLES.

Length above ground, feet.	Mean Circumference, inches.	Area of 2/3 of diameter, feet.	Mean Circumference, inches.	Area of 2/3 of diameter, feet.
20	27	9.54	30	10.59
30	30	15.91	34	18.01
40	35	24.73	38	26.86
48	38	32.24	41	34.79
58	42	43.06	45	46.15

A cubic foot of ice at 32° weighs 57.5 pounds, so by taking the average circumference or diameter of an ice-coated wire between two poles, and calculating its cubical contents in feet, then deducting therefrom the cubical contents of the wire, the weight of ice is readily ascertained.—*Telegraph Age.*

Measured Telephone Service

HAROLD D. STROUD

BEFORE entering into the details of the subject, it will no doubt be safe to assume that every one will agree that in operating a telephone system, traffic of the lines govern largely the cost of maintenance. If a plant were newly built and put in first-class working order and then left to stand idle for a short period, when again opened it would be found to require considerable repair to put it in its original condition. This being true, the cause must be directly charged to deterioration. It is therefore the work of the maintenance department to keep the system in prime condition and combat the many depreciating evils. Dust, acids, mice and carelessness all conspire to undo the work of construction. As in the building and operating of a railroad you may construct the finest roadway and equip it with the best rolling stock, but if you do not want the element of depreciation to eat up the investment you must have the best men obtainable in charge of the maintenance. To use the railroad comparison again, it is plain that the greatest element of depreciation, aside from those previously mentioned, is due to and in proportion with the traffic of the lines. It is estimated that a rail will last for a certain period; the ties will last about so long; the switches have a definite period of life, and so with the cars and engines, always directly proportionate to the number of cars carried or the number of miles the cars and engines are run, each element depending, to a certain extent, upon the other.

Therefore it would seem to be unreasonable and unbusinesslike to build a system of tracks, the life of which we know to be in proportion to the traffic that is to pass over them, and then for a fixed sum per year permit other cars to run without considering the effect of the added traffic. Railroad companies give due regard to this added traffic and the rate of compensation to the company owning the tracks will be found on a pro rata basis. They require a certain rate per car per mile for hauling and know if a definite percentage of gross revenue is laid away for maintenance of tracks, that when the time comes to rebuild, the money is available with which to do it. How many of the telephone plants in this country have this assurance?

This discussion of railroad methods may not appear pertinent to the subject, but it should show by comparison what is lacking in the telephone business, and why, after a few years of operation, some companies find themselves with an out-of-date system and a franchise, the latter their best asset. If from every connection completed through the switchboard a very small fraction of a cent were laid aside for maintenance and depreciation, this matter would be settled. An exchange having 9,000 telephones, each telephone originating ten calls per days and charging two cents per call by laying aside one-half cent per call for such a fund would have $450 per day or $164,250 per year.

Depreciation in telephone systems is always of interest. Every time a subscriber removes the receiver from the hook there is a mechanical movement of the switch tending toward wear. In the approved forms of switch hook there is little chance for actual wear, but in the course of a number of hundreds or perhaps thousands of such movements a screw or soldered connection may become loose or detached, perhaps interrupting the service and necessarily requiring a call by the inspector. So with the receiver and cords. Every time the receiver is taken up by the subscriber there is a liability of letting it fall, and we know that broken receivers are an item of expense. The receiver and transmitter cords, and on desk sets the extension cord as well, get one step nearer to the end of their usefulness every time the telephone is used, while the desk set being portable is always subject to a fall, which is most likely when picked up by a person desiring to use it.

What the average instrument maintenance cost chargeable to traffic is not known, for every make of telephone has a probable different factor of life, but care must necessarily represent some part of the cost of keeping up the system and this cost is nearly proportionate to the traffic.

The switchboard feels the load and gets more wear than any other part of the system. Every time a call is made some part of the switchboard, whether it be manual or automatic, gets one step nearer to its end regardless of how far off the end may be. Of the switchboard, the cords come first in regard to wear. Cords of different construction have a different average life. One type of cord used by the Bell companies for years has an average life of about 4,000 connections. Another about 5,250 connections, and the best cord has an average life of about 8,000 connections.

This being true we will assume that we are using the best cord referred to and an operator has fifteen pairs to handle. Then, if on the flat rate system the operators average 100 lines, each line averaging twenty calls per day, fifteen pairs of cords would have to handle 2,000 connections.

The calling cord has a little longer life than the answering cord, for the reason that the operator should always hold the answering cord in her hand ready to plug into the answering jack upon receiving a signal. While operators are thus waiting, some of them twirl the cord or keep moving it, while this is unnecessary wear, the fact remains that it exists. The calling cord is not so liable to wear on this account from the fact that the operator does not handle it except to put up a connection and take it down. In large multiple boards where the reach is long, this difference in favor of the calling cord might be overshadowed by the fact that some operators, especially those of diminutive stature, are frequently seen trying to take the calling cord out of the multiple by pulling on the cord itself, instead of grasping the plug, as they should do. The answering cord, of course, is directly before the operators and they are not so likely to try to remove it in this manner, except perhaps when they make long reaches in helping out the next operator on either side.

From the above figures the average life per pair of cords would be about sixty days, for flat rate and about twice as long for measured service rate. In this connection it is noticed that cords are more carefully handled when the operators are not overworked.

All parts of the shelf and cord equipment of the switchboard, including the lamps, plugs, supervisory relays and the listening and ringing keys, have a period of life in proportion to their use, and their use is proportionate to the traffic. This applies as well to the line equipment, including the answering jack, line lamp, line relay and the cut-off relay, where such form a part of the equipment.

It is needless to show the effect of line traffic upon the quality of service that can be given under such conditions. If a cord wears out and becomes "scratchy" or a connection of the plug, the jack, or the substation instrument becomes bad, the effect is noticeable by the subscribers in the char-

acter of the service they receive. This effect is not only noticeable on the calling party's line, but affects all other lines with which it is connected as well as the one upon which the faulty condition exists.

While considering the effect of measured service upon the maintenance department, reference has been made to the operating to some extent, because there are elements of the operating department and its jurisdiction which do not pertain directly to the handling of cords and supervising connections. The furnishing of battery at the central office for operating a system as well as ringing currents of various descriptions enter into the work of the operating department and are effected by the traffic to no small degree.

The current drawn from the batteries varies with the load. If we cut the load in two, we decrease nearly in that proportion the flow of current drawn from the batteries and generators. The only element which would throw this out of proportion would be a leak upon the lines which would exist whether the load was light or heavy.

It is little wonder, then, that large companies have come to realize the importance of the traffic department, because when properly handled, it becomes the pulse of the whole system.

The operating force of the exchange is quite a factor in the cost of giving telephone service. One hundred and ten operators that may be necessary to handle 9,000 subscribers' telephones on flat rates, operating at an average salary of $20 per month, require $26,400 per year for salaries. One of the trials of the management of a telephone system is to find novices who are quick to learn and can be depended upon to remain in the service for any great length of time.

At the present expense of operating the companies find it necessary to limit the period of apprenticeship and oftentimes they are put at the board to serve subscribers when unprepared to do so. If the operating force can be cut in half at a saving to an exchange of 9,000 subscribers of something over $12,000 per year, this point alone should be of sufficient importance to warrant a thorough consideration of the subject. A small portion of this saving could be advantageously expended in a more thorough training of the operators and the effect of such a course would be felt throughout the system.

Upon the equipment department alone falls the penalty of measured service, so far as the substation is involved, in the future and to a certain degree at the present time. As for the exchange, there are benefits to be derived that will almost, if not entirely, pay for the cost of installing the additional equipment necessary to care for the recording of calls or for collecting tolls.

In the consideration of charging devices only that type will be dealt with which does not reduce materially the number of calls that the operators can handle in a given period, as compared with the speed of operating on flat rate service. By this is meant a device whereby the operator is requested to perform no work of collecting or registering, that being done by the subscriber as an act precedent to calling the operator's attention to the fact that he desires a connection. Then only in the event that the call is not successfully terminated is the operator called upon to do any work. This work is simply the act of pressing a button before her to credit back the miscall or to refund the money deposited to call her. In a measured service system the percentage of times when she would have this work to do would be reduced considerably below the percentage which exists in a partially measured service system—such being represented by the "busy back," "can't raise" or "out-of-order" calls.

Assuming that we have devices of this character, and assuming further that one operator can handle the work of 100 telephones on individual lines, then with three operators to a multiple it would require the multiplying of the calling jacks thirty times in a system of 9,000 subscribers, the substation instruments and lines each having a full multiple. Then, as the traffic is reduced one-half by means of the charging devices at the substation, the operators would be able to give the same attention to about 200 subscribers. If the number of answering jacks and line lamps before each operator were doubled, one-half of the original board would be left vacant for future growth, or in a new plant fifteen multiples of the calling jacks only would be needed aside from the provision for future growth. This saving would be very great, as the smaller the multiple board, the smaller the cost per line for exchange equipment.

The only additional expense of installation required to operate the charging devices from the exchange, would be about one dollar per cord for the keys used by the operators to refund the coin, or credit the charge for the calls that were unsuccessful.

An ideal arrangement in the substation equipment for new installations (and in view of some developments along this line even for old work) would be the complete apparatus, that is, the telephone and coin box or a telephone and meter designed and built especially for this class of work comprising a neat telephone set in a metallic case and closely associated with it a coin collector or metering device, both the telephone and collector or the telephone and meter as the case requires, being mounted on a metallic back board or base. Such equipment would be subject to a minimum amount of deterioration and would not present the appearance of being built on the installment plan, as is often the case where such auxiliary devices are attached to regular telephone sets.

TRI-STATE TOLL ASSOCIATION.

Representatives of the various Independent telephone companies of eastern Ohio, western Pennsylvania, northern West Virginia and western Maryland met at the offices of the National Telephone Company in Wheeling, W. Va., on February 3, and formed the "Tri State Toll Association" for the purpose of controlling the present long distance lines, fixing the method and schedule of charges and the construction of new lines where the present facilities are not up to the standard.

The headquarters of the association will be in the offices of the National Telephone Company, and the work will be in charge of the secretary-treasurer. The gathering and preparing of all data such as tariff sheets, route lists, and the mapping and distributing of the lines and territory is now under way, and when completed the association will be ready for business.

It is the intention of this association to improve the condition of all the companies in the territory covered, and the further intention to ask all telephone properties not yet in the association to join the movement.

The companies now affiliated with the "Tri State Toll Association are: The National Telephone Company, Consolidated Telephone Company, Beeghley Telephone Company, Buckhannon Telephone Company, Burton and Mannington Telephone Company, Exchange Telephone Company, Cameron Telephone Company, Belmont Telephone Company, South Penn Telephone and Telegraph Company, Pine Grove Telephone Company, Union Telephone Company, and Flushing Telephone Company.

The officers elected at the meeting were J. Walter Barnes, Fairmont, W. Va., president; H. A. Doudna, Bridgeport, O., vice-president; W. C. Handlan, Wheeling, W. Va., secretary-treasurer.

I was one among your first subscribers and have never missed a number. I retain all back numbers and often refer to them. I would not be without TELEPHONY for twice its cost.—C. F. Day.

Women Telephone Employees in Germany

J. F. MONAGHAN

AS EARLY as 1820 and 1830, France and England employed women in the postal and telegraphic service. Germany, however, did not make a trial of feminine service until 1874. The main circumstance that led to the employment of women at that time was a scarcity of available men. When later the administrations of the postal and telegraphic services were combined under one head, a general discharge of the women who had obtained positions in the service followed, largely, so it is reported, because Postmaster-General Stephan, who wielded a determining influence at the time, was irreconcilable in his opposition to the employment of women in the postal and telegraphic service. Hence, all women engaged in the telegraphic service were removed, and only a comparatively small number of those employed in the postal service reluctantly retained as a further experiment. Three years later, in 1876, these also were separated from the service of the empire.

The successor of Stephan, Postmaster-General Podbielski, was favorably disposed toward the employment of women. He laid considerable weight upon the successful experience with women in foreign countries, especially in the United States. Through his support and influence women were again introduced into the postal service, though only in limited numbers and purely for the purpose of further trial. The result was quite as satisfactory as had been expected, and since then the number of women in the German postal, telegraphic and telephonic service has been rapidly increasing, until to-day they comprise an invaluable and indispensable part of the same.

In all postoffices of the third class women assistants are appointed by the postmasters of the place, under strict limitations, however, of government regulations respecting age, character and education. Such assistants must be of sound health, certified to by a government medical examiner. They must be entirely free from all deformities, of stainless character, from eighteen to thirty years of age, and must possess a good common school education. The highest salary that may be paid to such assistants at third-class postoffices is 500 marks ($119) per year. In postoffices of the first-class and at railroad postoffices women may be engaged for service as typewriters or similar duties only. All women assistants have the character of government officials, which means that on their withdrawal from the service after faithful, competent work during a prescribed number of years they have a claim to a pension under the law of the empire, if their circumstances are adjudged such as to require it. Instead of being qualified to occupy only a certain class of specified positions, as was found to be the case in the German postal service, women are privileged to take any positions whatever in the telegraphic service, subject at all times to the above enumerated regulations respecting age, character and education. They have a similar claim to a pension as those engaged in the postal service and in all respects are similarly employed, privileged and discharged.

At the present time 4,000 women are employed in the telephone service of the German empire. In Berlin alone 1,000 women are engaged. These positions are so popular and the number of applications is so large that the number of accepted and qualified women whose names have been registered in the order in which they were considered is so large as to supply occupants for any possible vacancies that may result in the course of the next few years. Only physically strong girls are admitted to the service. They must possess a good character and be of respectable families. They must be between eighteen and thirty years of age and either unmarried girls or widows without children. Every applicant must possess an education equivalent to graduation from an elementary school. In making the application for a position it is necessary to produce a birth certificate, school certificate, certificate of conduct, in which are registered all praise or dissatisfaction expressed by previous employers of the person in question, and a brief biography. The latter must have been written and constructed solely by the applicant. The written consent of the father or guardian is also necessary. Some time after the application, accompanied by all the required papers has been filed, notice is sent to the applicant to appear for an examination, which embraces ordinary questions of arithmetic, German and geography.

After successfully passing the examination the applicant is sent to an official medical examiner, who must certify as to her physical soundness, and especially as to the condition of her lungs and nerves.

Having successfully acquitted herself in all the foregoing tests, the applicant is now ready to begin a period of practical preparation. This work as an apprentice covers from three to four weeks, and during the time the learner receives no salary. Having satisfactorily completed her period of practical study, the applicant is ready to enter upon a regularly paid position. Since, as was already stated, the number of applicants is always extremely large, a number of months or even a year or two may pass before a vacancy occurs. A position being open, the applicant cannot enter upon the same if she has in any way, in the meantime, spoiled her record or failed to preserve a stainless character. She must also, at the time of her employment, be living with her parents, or in some other respectable place free from all question.

The daily hours of employment vary from six to eight; sometimes Sunday work is required. The employe must, immediately after being engaged, begin her contributions to the sick fund, and in case she succumbs to sickness or injury she continues to draw three-fourths of her regular salary and receives free medical treatment. Her pay to begin with is 2.25 marks (53.5 cents) per day. After two years of satisfactory service this is raised to 2.50 marks (59.5 cents) per day. After two additional years—that is, after having been four years in the service—her pay is raised to 3 marks (71.4 cents). If, after service for several more years, the girl has shown herself capable and unusually diligent, she may be appointed as supervisor, with an annual increase in pay of 100 marks ($23.80).

After ten years of faithful service another advantage is added in the form of appointment with full claim to a pension. After being thus engaged, her salary amounts to 1,100 marks ($261.80). This salary is then increased every three years by the amount of 100 marks ($23.80) until it amounts to 1,500 marks ($357). This is the highest salary that a woman can draw in the German telephonic service. It is sufficient to insure a comfortable existence to the employe, though to an American the amount may seem somewhat small, even for an exceedingly plain living. It must be remembered that the German women living in Germany who belong to this class of wage earners can live with consider-

ably less expense and with much greater comfort than would be possible in the United States.

In England the salaries of positions of this kind are much better paid. Girls are admitted to the service at 15 years of age. During the first years, while they are "girl clerks," they receive from 800 to 900 marks ($190.40 to $214.20). When they receive a permanent position as "women clerks" their salary is increased to 1,100 to 1,200 marks ($261.80 to $285.60). After twelve years of faithful service they receive the considerable salary of 2,400 to 2,500 marks ($571.20 to $595). The best women are even appointed to positions as chief supervisors or assistants in first-class offices, with a salary of 10,000 marks ($2,380).

MEETING OF INDIANA MANAGERS.

In response to a letter by Theodore Tharwood, president of the Home Telephone Company of South Bend, and J. K. Johnston, general manager of the Home Telephone Company of Elkhart County, to the telephone managers of Marshall, La Porte, Kosciusko, Fulton, Starke, St. Joseph, Elkhart, Noble and Pulaski Counties, Indiana, and Berrien County, Michigan, a meeting was held in the office of the Home Telephone Company at South Bend, January 28, 1904. The purpose of the meeting was to discuss the advisability and to plan a perfect, practical and economical system of handling the toll business in the above mentioned territory.

The following representatives were present: G. S. Van Dusen, secretary and treasurer of the Merchants' Mutual Telephone Company, Michigan City, representing 750 telephones; E. G. Stacy, general manager, and J. N. Price, vice-president, of the Twin City Telephone Company, Benton Harbor, Michigan, representing 1,375 telephones; W. S. Danil, manager of the Winona Telephone Company, Knox, Indiana, representing 200 telephones; W. A. Diggs, manager of the Winimac Telephone Company, representing 315 telephones; Frank M. Brown, manager of the Wakarusa Telephone Company, and A. G. Shalliol, representing 150 telephones; C. R. Myers, president of the Farmers' Mutual Telephone Company, Millersburg, Indiana, representing 185 telephones; I. M. Pancake, president by proxy of the Dunlap Telephone Company, Dunlap, representing 150 telephones; Theodore Tharwood, president of the Home Telephone Company, South Bend, representing 2,700 telephones; J. W. Scott, general manager of the Commercial Telephone Company, Warsaw, Indiana, representing 400 telephones; C. A. Reeves, manager of the Plymouth Telephone Company, Plymouth, Indiana, representing 300 telephones; R. C. Stevenson, manager of the Rochester Telephone Company, Rochester, Indiana, representing 430 telephones; C. E. Koontz, manager of the Bremen Telephone Company, Bremen, Indiana, representing 136 telephones; Claude R. Stoop, manager of the Napanee Telephone Company, Napanee, Indiana, representing 275 telephones; L. M. Neher, manager of the Royal Telephone Company, Milford, Indiana, representing 275 telephones; James A. Arthur, representing the Goshen, Indiana, exchange of 750 telephones, and J. K. Johnston, general manager and secretary of the Home Telephone Company of Elkhart County, representing 1,742 telephones.

The meeting was called to order by J. K. Johnston, and upon motion of Mr. Johnston and seconded by Mr. Stevenson, Mr. Van Dusen was elected chairman. Upon motion of Mr. Stevenson and seconded by Mr. Reeves, J. K. Johnston was elected secretary. The secretary then read the following paper explaining the purpose of the meeting:

The devisement of a perfect system for the practical and economical handling of toll business is the vital question for our immediate thought and our immediate action. A system to be effective and satisfactory must be governed by certain fixed rules, which must be clear, concise and readily applied in practice. We must first determine upon a basis for our traffic charge. In the past almost every conceivable plan has been suggested. Let us, therefore, drop our present methods at once; let us demand that this body of representatives establish a traffic committee with power sufficient to put into operation at once a practical system.

After having determined upon a uniform and practical method of determining rates, it will then be necessary for us to apportion these rates equitably among the parties whose stations and lines have produced this value. The method now in general practice, both by the Bell and Independent companies, is to grant to the originating station a certain commission on the toll charged; the balance after such deduction is to be divided pro rata in proportion to land air-line mileage traversed between points of origin, transfer and destination.

Some plan of general and rapid settlement is now necessary. Any two stations can readily effect a settlement for traffic from one to the other, and this they should do, but it is a most impractical task for any company to adjust its accounts with every other company without the assistance of some traffic exchange or clearing house. Each company should report promptly upon proper slips and reports supplied by the clearing house for all business between connecting companies to be checked, corrected and the balances adjusted and settled by draft. This system, when established and invested with proper authority to perform the functions of a clearing house, is exceedingly simple. Let our records, books, checks, slips, scales and maps, and our methods be made uniform, and our toll proposition will develop amazingly in simplicity and value. We need the most careful guidance to build strongly and to build well, and we need at once assistance that will produce a uniformity of practice in this most important field of toll service. We must act at once and secure such plan as will bring us immediate relief.

After considerable discussion by the different representatives, in reference to a system in handling the toll business of the territory represented, it was moved by Mr. Tharwood and seconded by Mr. Arthur, that the representatives of the following counties organize into an association for the purpose of perfecting plans referred to, embracing the following counties: Marshall, Kosciusko, St. Joseph, Fulton, Pulaski, Starke, Elkhart, and La Porte Counties, Indiana, and Berrien County, Michigan.

Moved by Mr. Reeves and seconded by Mr. Scott that the chair appoint three members to act as acommittee to select five members as a standing committee and to report the results at the same meeting. The chairman appointed Mr. Diggs, Mr. Brown and Mr. Stevenson. The meeting then adjourned for five minutes recess in order to allow the committee to make their selections. After the meeting was called to order the committee reported the following members as chosen for the committee: Theodore Tharwood, C. A. Reeves, Claude Stoop, J. K. Johnston and J. W. Scott.

It was moved by Mr. Stacey and seconded by Mr. Arthur that the headquarters be at South Bend, and it was moved by Mr. Tharwood, and seconded by Mr. Stevenson that the secretary enter into communication with the United States Telephone Company of Cleveland, Ohio, in reference to the poor condition of its line east from Kendallville.

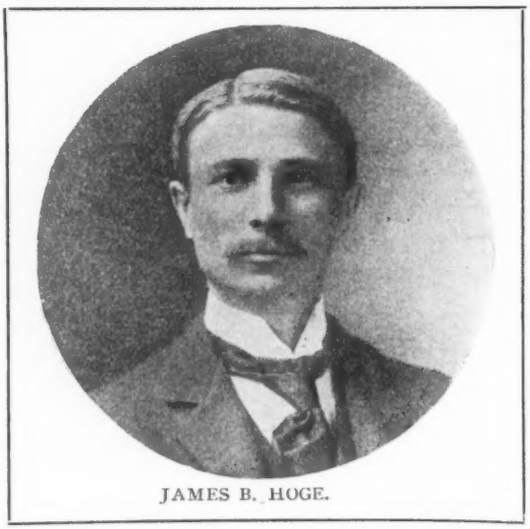
Moved by Mr. Danil and seconded by Mr. Stacey that the committee be instructed to make its report within thirty days and to notify the members of the association the date of the next meeting. Upon request of Mr. Scott the secretary was requested to correspond with the new Long Distance Telephone Company, with headquarters at Indianapolis, to build ample lines to handle the business from northern Indiana to Marion, Indiana, and to points east and west from Indianapolis. There being no further business the meeting adjourned.

At the conclusion of the meeting, the visitors were invited to dinner at the Oliver House, the Chicago Telephone Supply Company of Elkhart acting as host through its officers. Mr. George A. Briggs and Mr. H. C. Randall of this company attended the meeting and displayed a full line of samples.

TELEPHONY is certainly a bright light on the path of any telephone man who will let it shine for him. I feel as though I could not get along without it.—G. W. Leyda.

Independent Telephone Situation

JAMES B. HOGE



JAMES B. HOGE.

The word "Independent" was not applied to the telephone until 1894. For some five years prior, the press had been calling attention to the fact that in 1894 the patents covering the use of the telephone would commence to expire and therefore the public would be allowed to use it without paying excessive royalties, yet but few people at that time had any idea of going into the business and fewer still had any special knowledge of the business, due principally to two things: First, the parties controlling the patents had taken special pains to keep their employes from getting a general knowledge of the art, and second, no one had the slightest conception of the demand there would be for telephones when they were placed upon a commercial basis.

Statistics show that there were less than 300,000 telephones in operation when the Independent telephone movement was inaugurated in 1894. The original patent on the telephone was granted to Alexander Graham Bell, March 7, 1876. Elisha Gray had exhibited his electrical telephone in December, 1874, at a musical entertainment in a Presbyterian church in Highland Park, Illinois.

The policy of the original company, as adopted by the officers, was one of limiting the business to the more wealthy class and then charging all that that class of subscribers would pay. The foregoing brief history is given for the purpose of showing the groundwork for the formation of the Independent telephone movement.

The question is often asked, "Who built the original Independent telephone exchange?" No one knows, and it seems to be agreed that it is beyond the historian's ability to solve it. We are quite certain it was not patented, because no suits have been brought for infringement and the exact time of commencing operation is as uncertain as the age of Booker T. Washington, who in answering the question as to how old he was, said: "I do not know, but I do know this, that at some place and at some time, I was born." We know that at some time and upon some particular day or days, before the owners of the original patents regarded it safe for anyone to even think of entering the telephone field, let alone actually commencing the work of installing a plant, a large number of America's patriotic sons had embarked in the business and they have been adding to their number each week since. It is stated that last year there were over one thousand Independent telephone companies organized in the United States, or an averaeg of over two companies organized each and every day, Sundays and holidays included. This kind of development, to say nothing about the large number of people that are becoming interested from week to week in the further development of the existing exchanges, makes it very difficult indeed to even estimate the number of people that are directly interested in the Independent telephone development of this country. When this movement was inaugurated the conditions of the country were just right to receive it. When the representatives of the thirteen colonies met in 1776 to consider the principal points at issue, most of them knew that they were not enjoying the freedom and privileges that God intended them to have, and while no radical action was taken at the first part of their session, they had many serious conferences which resulted in bringing over the conservatives to a point where they finally approved the signing of the Declaration of Independence, a paper that is acknowledged to-day to be the greatest contract ever drawn. The Independent telephone development, like the Declaration of Independence, has proven to be popular. The battles fought by those engaged in the Independent telephone development against the so-called "war measures" of their opponents who were actually giving free service, making threats against the subscribers, stockholders and officers of the various Independent companies, and last but not least, the battles that were fought in the various courts of the United States wherein an attempt was made on the part of those controlling the patents to have them hold good for an additional fifteen or seventeen years, bear a resemblance to the battles that were fought by the colonies.

The following paragraph from the London *Electrical Engineer* is especially interesting as it shows the English view of monopoly:

> Monopoly has nowhere shown itself to be so detrimental to the public good as in the telephone field, as is evidenced by the experience not only of this country but particularly of the United States and Canada. Happily this state of things in the two last named countries has in recent years radically changed by the expiration of the fundamental patents. The remarkable growth of Independent systems in the states is just beginning to be experienced in Canada, where the future of Independent telephony is looked on as already assured. At the present time there are sixty Independent companies carrying on operations in the Dominion. Looking at the progress in the states, it is seen how the business has been developed in the past five years by the Independent companies. More Independnt exchanges have been established and more telephones put into use during that priod than were used during the twenty years previous that the Bell company held a monopoly of the field. The effect of the competition of these companies has been to bring the rates down to a legitimate basis and to give a first class service.

There is a little story, which a very prominent eastern attorney used to tell on himself, about purchasing a farm out of New York some miles, where he would go occasionally to get away from the cares of his office. He stocked this farm so as to make it pleasing for his family as well as for himself. Among other things purchased was a donkey, which arrived at the farm while he was in New York. The donkey undertook to get acquainted with the other animals on the farm by doing his share of the braying which annoyed the attorney's little daughter considerably, so she wrote to her father in New York as follows: "Dear Papa:—Please come home, the donkey is lonesome." Our competitors have brayed much about the Independent situation, advising that the patents had not expired and that it would be but a short time until all the Independent telephone users would be sued for using instruments covered by patent of Alexander Graham Bell, No. 463,569, and that those who were so unfortunate as to own stock in the Inde-

pendent companies would be pleased to turn over a deed to all they possessed, including their birthright.

When this failed to work, they started off to actually give away service under what was termed "war measures," continuing, however, to charge the full tariff rates where they had no competition. From this source they thought they would be able to derive sufficient income to live on while they bankrupted the Independent companies that had undertaken to compete with them. This having failed, they then tried to make arrangements with the Independent companies to furnish long distance service and they would license them, allowing the use of switchboards and instruments patented by Alexander Graham Bell and others for a consideration of so many dollars per month.

About this time the Independent people went extensively into the long distance business themselves, and during the last four years the Independent long distance lines of this country have grown as rapidly as the exchanges, and to-day there are but few Independent exchanges that do not enjoy extensive long distance service over lines owned and controlled by the citizens of their respective states.

The war measure now seems to be that of notifying the "dear public" that telephone securities are not safe and that they must not invest in anything so hazardous as telephone bonds or stocks, unless they are in some company with headquarters in Boston. This measure of warfare is equally as ridiculous as any of the other measures adopted, and it will taks but a short time for the "dear public" to understand that they do not wish, nor have need, of a guardian. In other words, the Bell company needs to have some one write a letter calling its advertising agents home because the donkey is lonesome.

The stock of the American Telephone & Telegraph Company in April, 1902, was selling at $186 per share; the same stock sold in October last at $117.25 per share. It is true that Independent telephone securities, like securities of other public-serving corporations and other industries of the country, have not found as ready a market during the past year as they did prior to that time, yet I do not hesitate to tell you that the Independent position is stronger to-day than it ever was. All the large failures in the telephone business have been on the other side of the house.

The *Canadian Engineer,* one of the leading technical papers of the Dominion devoted to electrical industries, says:

> The question of starting Independent companies should be determined, not by a feeling of resentment against the Bell monopoly, however much this feeling might be justified, but by a cool calculation on the part of local investors as to whether they can give a better service to the people, at a reasonable price, and at the same time secure a good return for the money invested. The remarkable thing in the history of the Independent telephone movement in the states is that in spite of the poor management of many of these local companies, starting as they have without previous experience, and putting in unwisely chosen managers, there have been scarcely any cases of absolute failure, while those few cases of unprofitable investment have been due to causes which would have shown worse results in almost any other business.

Our weakest points in the past have been, first, the fact that we did not have sufficient long distance lines to take care of the business, and second, that we did not reach the principal business centers of the United States. We must admit that there has been ground for criticizing our movement on that basis, but on the other hand, we must not forget that the Independent people have only been in the business for approximately nine years. The first three years of that time were spent very largely in experimental work and in fighting for an existence. Those who were called upon to defend the numerous suits that were started against the manufacturers, telephone companies and users, remember well the numerous conferences that were held to devise ways and means of getting the true situation before the courts and the people of this country. During the past six years the development has been extended to one large city after another until to-day there are less than two dozen cities of special importance in this country that do not have Independent telephone connections, and the indications are that a number of them will be built in the near future.

Within the last four years the Independent companies have been building long distance lines from city to city and state to state until the foundation has been well laid, but there is much to be done yet to complete the long distance system. Not so much, however, when one considers the number of people that are engaged in the business and who will join together at the same time to do the work. This will be seen more clearly by the map displayed, which gives information for the first time in the way of showing the main trunk lines actually built or building, together with those contemplated in the near future. We will not attempt to show the development in but a few states, for the reason that time will not permit, but maps and letters received show that a majority of the counties in the United States are quite well developed in one way or another, so that all we need to do is to reach an understanding of our combined strength. This is not necessary for the purpose of consolidating under one management or one large stockholding company, but under *one banner* with the understanding that we will divide up the territory and each one develop his particular field to its fullest capacity, handling his particular properties on a strictly business basis. It should be borne in mind that the public is our friend, and in case we are not receiving proper compensation for our services, let us be frank enough to say so and agree upon a basis that is fair to both sides. We have increased our number of subscribers from 100 to 500 per cent in the last six years—a service which is of more value to our subscribers now than it was when we inaugurated it.

The public is ordinarily fair-minded when we take it into our confidence. Abraham Lincoln, in his famous speech on "The Battlefield of Gettysburg," November 19, 1863, spoke of a government "of the people, by the people and for the people." The Independent telephone movement was organized to take care of the demand "of the people, by the people and for the people," and they are no more likely to forget the condition of the telephone business prior to the time the Independent movement was organized, together with the experience they have had in a few instances where the Independent people have been forced out of their position, than they have been to forget the Civil War and its results.

The farmer's life has been revolutionized during the past ten years. The patents had scarcely expired when the farmer was installing telephones for the purpose of connecting with his nearest neighbors over a crude telephone usually connected over a grounded fence wire, but in a short time they were connected up in little exchanges giving them connection with the postoffices, and in many cases, the county-seats. This kept on growing until the company had the country seat and every postoffice in the country connected, and then they began to talk from one county to another.

The United States government, seeing the wonderful development of the business and the ability of the farmer to adjust himself to improvements and the good things of life, commenced to experiment a little on its own account, and finding that it paid to take better care of the farmer's mail service, established rural mail delivery. Now comes a recommendation to the postoffice department for a still further convenience whereby the farmer can have his mail actually read to him over the telephone by the postoffice employes, if he will have a special stamp affixed. Yet one of our government officials was evidently not informed that the rural telephone exchanges in a majority of cases are owned by the farmers, and that they are not connected with Washington or Cincinnati. This official and about all the other government employes have had their attention called to the matter in no uncertain way within the last ninety days.

Is there any reason for some central company owning all the electric light plants, gas plants, water companies, street car and steam railway systems, banks and bakeries of this

country? If not, then why should the telephone be controlled by one central company? The stock in these companies is a safe and conservative investment for the various citizens of a community to own, and it is perfectly proper for the profits to be distributed where they are made. The long distance lines are arranging working, or traffic, agreements, whereby the business is cared for over the various lines so that the public does not know where one line leaves off and another commences. This arrangement will be very materially extended during the next six months. It is generally conceded to-day that the service over the lines of the United States Telephone Company of Ohio, the New Long Distance Telephone Company of Indiana, the Independent long distance lines of Kentucky, and the Kinlock Long Distance Company of St. Louis, is as good as that given by any company in existence. This might be said for a number of others. The through business can be handled by the proper traffic arrangements, the same as coupon tickets are sold over the railroads and freight is billed through over the various freight lines of the country. The long distance companies are bound to make uniform working arrangements and adopt uniform rules. As long as the people continue to own their own lines, they will see to it that the service is kept good and the price kept on a reasonable basis.

The Independents have spent millions of dollars in developing a business that has been changed from a luxury to a public necessity, and you need have no fear about the public getting along without your service any more than they will without any of the other necessities. I was told a few days ago, about a farmer that said he would get along without his tobacco rather than do without the telephone.

Investors who buy Independent telephone securities need have no more fear than they would have in handling securities of any other public-serving corporations, and securities in many of these companies to-day are considered the choicest and safest of all the public-serving corporations. The telephone system is unique in that the subscribers are under contract to pay so much per month, quarter or year, and although the subscriber may be thrown out of work, he usually figures it will be temporary and the telephone goes on, the subscriber perhaps economizing on his provisions and clothing, walking many times instead of riding on street cars, buying fewer daily papers, turning off the gas or electric light when not actually required, but the telephone is under contract; therefore your business only needs to be understood and well managed in order to make it satisfactory in every particular. See that this is done. Lend a helping hand to your neighbor who is enegaged in the same business.

The properties composing the Western Union Telegraph Company were at one time a disconnected lot of lines without any general system. They were afterwards brought together on an operating basis, working arrangements having been perfected between the various companies and individuals until the property was operated from ocean to ocean. This was due very largely to the efforts of the late J. H. Wade of Cleveland, O. The steam railway systems of the country were started in the same way, and they are all working to-day in conjunction with terminals, belt line companies and connecting lines. There was a time when they found use for their earnings in developing the business tributary to their lines, but to-day most of them are paying dividends and issuing additional securities to take care of their extensions. The Pennsylvania Company borrowed $50,000,000 within the last three weeks, and the Lake Shore $40,000,000 within two months, this money to be used for betterments of their system and needed extensions, but principally in the way of betterments such as cutting down grades, building new terminals, double tracking, and adding more rolling stock. The financial world regards this as good financing.

The Independent telephone companies of the country, in many cases, have been using their earnings to take care of these needed extensions and improvements, thereby neglecting the payment of dividends, so that the public has been led to believe that they were not earning a sufficient amount to pay dividends.

It has been very interesting to note the reports that have come in during the last few days from all over the country, and while time will not permit me to give you details, the map gives you a bird's-eye-view of the general development, and will undoubtedly convince you that this year will be noted for two things; First, the various trunk lines of the long distance systems will be connected, so that it will be possible to talk from Philadelphia to Kansas City and Topeka, Kansas; from Albany, New York, to St. Paul, Minnesota; from Chicago via St. Louis to San Antonio and Galveston, Texas, and between practically all of the other cities where Independent exchanges are installed east of the Rocky Mountains. You will also note that there is quite a development on the Pacific Coast. Second, the various exchanges throughout the country will be better developed and put on a better operating basis and increased in efficiency. The general manager of the Los Angeles company advises that they now have over 11,000 telephones working with over 5,000 on the waiting list, and that this year will see a large development at other points in the state. I am also advised that the development around Seattle is now being put on a substantial basis. You will also note quite a development around Portland, Maine, right in the heart of the Bell territory. The manager of that property advises that this year will see a very large increase in its number of subscribers and also increased development of toll lines. An officer of the Kansas Independent Telephone Association writes:

> We have an excellent state organization, which includes in its membership about eighty-five per cent of the commercial operating Independent plants. Our state organization does not admit so called mutual concerns. There are probably 50,000 Independent telephones in this state, exclusive of the farmer mutual lines. * * * I have no hesitancy in saying that no state has so thoroughly eliminated the Bell people from the exchange business as has Kansas. * * * Outside of Kansas City and the Missouri River towns the Bell company has probably not to exceed 4,000 telephones in the state. * * * The completion of the splendid plant of the Kansas City Home Telephone Company, in Kansas City, furnishes a nucleus for the long distance lines, and a connection with the commercial metropolis of our state, which has been the one thing needed for the complete success of the Independent interests of Kansas.

It is interesting to note what can be done in this line with proper management and with the proper kind of assistance from the local people. I know of a company that has increased its investment during a given period 19½ per cent and increased its *net* receipts during the same period 46½ per cent, or more than 17½ per cent *net* upon the capital invested. This increase placed that company upon a substantial basis. The company now has over 45 per cent more telephones than its competitor. I know another company that increased its net earnings over 35 per cent without raising the rates by collecting up closely and attending strictly to business, and by the expenditure of a very small amount for securing new business. This is not possible with all companies. The best managed companies do not lose on account of poor collections over one-half of 1 per cent of their gross charges, many of them losing less than one-tenth of 1 per cent.

The long distance lines are practically all overloaded and require more copper to be strung this year. Arrangements have been made by a number of the companies to take care of this. The best data that is available to-day shows over two million Independent telephones in operation in the United States, as against less than 1,600,000 operated by the Bell company. Some time ago Alexander Graham Bell, the patentee of the telephone, when asked how many telephones there were in the country is reported to have answered, "That is way beyond me. The Bell patents have expired, there are so many companies manufacturing equip-

ment now and the development has been by such leaps and bounds that no one could keep track of the number of telephones." The Bell people themselves claim over three million telephones, but they do not state in their reports that they count a transmitter and a receiver as two telephones, while the Independents count them but one, and in reality a telephone is not complete unless it is equipped with both a transmitter and a receiver.

In conclusion, I wish to remind you that our greatest danger comes from the fact that we do not appreciate how extensively the Independents have developed the field. We do not appreciate our strength nor the size of the army of people interested with us. This army of investors and operators is composed of the wealth, ability and activity of the various states, and nothing can stop their growth in the future any more than it has in the past.

There is nothing the American citizen enjoys better than to feel that he is part of a good organization. His confidence once gained, he becomes a supporter of the cause and the battle is won. The Independent telephone movement is organized along those lines. Let that principle continue to be prominent. The commercial development of the United States is still in its infancy; the demand for the telephone, like that for the daily paper, will continue to grow, not only as the country develops, but there are business people today who are doing without the telephone for the reason that they do not appreciate its value. They are, however, becoming educated to its use from day to day. You do not need to get business away from your competitors in order to be successful, but take care of the new business that is constantly being offered. Take proper care of your plant, charge fair rates, see that your companies are well managed, and the business now served by your competitor will, in part at least, come to you unsolicited.

Everyone is susceptible to the influence of some leader, however unconscious he may be of the fact; therefore, it is important that each one study his property more carefully and develop it more completely, and strive to increase his business by improving his service and by getting his stockholders, bondholders and employes to understand how extensive a service the Independent people are furnishing, that it is second to none, that it needs few apologies, and that the weak points will be corrected at the earliest possible moment. Assist your neighbors and they are quite likely to assist you whenever an opportunity offers.

FORM OF CURRENTS IN INDUCTION COILS.

An interesting series of experiments has been made by M. H. Armagnat with the Blondel oscillograph. Experiments were made to determine the form of the primary current wave, the P. D. between the terminals of the primary coil, and the rate of change of the magnetic flux by means of a small search coil wound on the iron core. The records were received on a photographic plate, the duration of the oscillations at the moment of rupture being exceedingly brief.

The primary current followed the form indicated in Fig. 1, the coil being of 35 cm. spark, and the interrupter being of the mercury type. The resistance in circuit was eight ohms, allowing a maximum current of fifteen amperes to pass at 120 volts, and the capacity shunted across the break was 6 mfd. The figure shows that the ratio of the first elongation to the second is far greater than the ratio of successive elongations afterwards, which is practically constant; moreover, this ratio is much greater than theory would lead one to expect. The explanation for the former phenomenon lies in the loss of energy in the spark, while the latter is due to the loss by hysteresis in the iron core. The effect of the saturation of the iron core upon the primary current is to radically alter the shape of the wave, the self-induction of the primary being diminished. By means of the curves it was shown that the irregularity of the sparking when the secondary terminals were separated to the utmost was due to the defective action of the interrupter. By adding capacity to the terminals of the secondary coil, oscillations of extremely short period were produced, which had no apparent connection with the calculated frequency of either the primary or the secondary coil; three independent sets of vibrations were detected, of widely different characteristics. When the secondary circuit has low resistance or large capacity, the reaction of the secondary oscillations is so great as to cause violent oscillations in the primary current, as shown in Fig. 2, where the rather irregular interruptions are indicated by the letter R. The effect of "false contacts" at the interrupter is illustrated by Fig. 3, under similar conditions. The same coil, without capacity at the terminals, gave Fig. 4, the diminished reaction being clearly evident, as the primary current fell to zero quickly and almost without oscillations, the energy being absorbed by the secondary spark of 20 cm. The curve of dN/dt given below the primary current curve shows the form of the E. M. F. wave in the secondary. On reducing the length of the spark to 2 cm., the secondary current so much retards the demagnetisation of the core, that the interrupter armature is held back and the interval between breaks largely increased. Experiments made on a very large coil for radiography, with a closed iron circuit and a primary coil excited by an alternating current, produced some curious results. Fig. 5 shows the violent reaction of the secondary current on the primary at the moment of the passing of the spark in the spark-gap, and the presence of the twenty-fifth harmonic in the primary current is clearly shown. The latter is due to the resonance of the secondary circuit, containing two condensers and the spark-gap, and furnishes a means of estimating the capacity of the latter circuit. When the gap was short-circuited, bringing the capacity of the condensers into play, the eleventh harmonic was resonated, as in Fig. 6. Other experiments related to the action of the Wehnelt interrupter, and showed that the current never falls to zero, while the rate of make is nearly as great as that of break, so that two sparks can be obtained per interruption.—*From the L'Eclairage Electrique.*

FIG. 1.

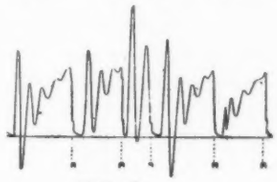


FIG. 2.

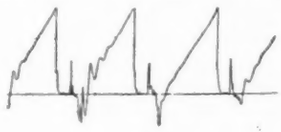


FIG. 3.

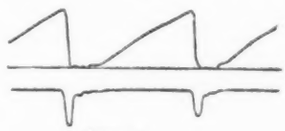


FIG. 4.

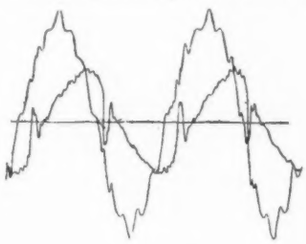


FIG. 5.

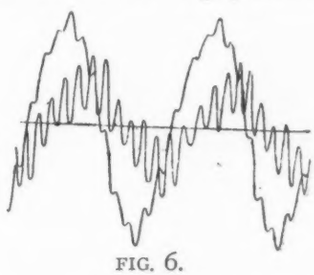


FIG. 6.

I am very well pleased with TELEPHONY and do not know where to make a small investment which will give better returns.—C. E. Tarte.

Telephony.

AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

TRUTHFUL ❧ FEARLESS ❧ INDEPENDENT

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CHICAGO, MARCH, 1904.

Table of Contents.

Wisconsin Independent Convention....159-164
Transposition of Telephone Lines....165-174
Independent Telephony in New York....175-176
Telephone Convention Papers....177-180
Northwestern Iowa Convention....180
Commercial Aspect of the Automatic. F. J. Dommerque..181-184
Method of Carbon Resistance....184
Wind Pressure on Aerial Lines. F. W. Jones....185
Measured Telephone Service. Harold D. Stroud....186-187
Tri-State Toll Association....187
Woman Telephone Employes in Germany. J. F. Monaghan....188-189
The Independent Telephone Situation. J. B. Hoge....190-193
Form of Currents in Induction Coils....193

EDITORIAL—
- Telephony's Advertising Rates....194
- Pumping Water Into Telephone Stock....194
- The Passing of the Kellogg Company....195
- Decline of Bell Stock....195
- The Michigan Bell Holdup....196
- Bell Methods in Canada....197

The Iowa Convention....197
Michigan Telephone Convention....197
Ohio Telephone Convention....198-200
Digest of Telephone Patents. Edward E. Clement....201-207
Questions and Answers....208-209
Fifty Million Bell Suit. Ossian Cameron....210-212
Mr. Bennett's New Venture....212
The Lorimer Machine Telephone. F. Daggar....213-220
Telephoning Over Tracks to a Moving Train....220-221
Cuyahoga Company's Annual Statement....221-222
Personal....223

MANUFACTURERS' DEPARTMENT—
- Electrical Supply Company....224-225
- Standard Underground Conference....225
- Sterling Electric Company, Lafayette....226-229
- Diamond Expansion Bolt....230
- Metropolitan Expansion Plug....231
- Trade Notes....232-236
- The Bissell Pole Distributer....236
- Defects of the Multiple Exchange....237-238

Newark Telephone Company Rebuilds....238
Incorporations of the Month....239-240
Annual Meetings....240

TELEPHONYS ADVERTISING RATES.

A large advertiser in a recent letter to this publication makes this statement: "We have always believed that many of the larger companies have been discriminated against in the price they pay for advertising. We feel that all trade papers should cut out charity advertisements, and the giving of wholesale or inside rates to their friends and others."

We heartily agree with this advertiser and believe a trade paper should treat all its advertisers alike, without favor to any one. The advertising manager of a publication is often met with the statement: "We will place some business with you if you will give us an inside proposition." In some cases the inside proposition is given, not to one but to many, and the result is, that in a very short time the fact becomes generally known and that particular publication loses prestige in the eyes of the advertisers, and its fate is sealed.

TELEPHONY has met with a good deal of opposition on account of its not being willing to grant concessions in this respect. We have held to the policy of fairness in the matter of our advertising charges, and defy any advertiser to make the statement that he gets any special concession in price. In order that there may be no uncertainty as to our position in this matter, we print herewith our present advertising rates which appear on the reverse side of our advertising contracts:

	1 issue.	6 months.	1 year.
Full page	$60.00	$55.00	$50.00
Half page	35.00	30.00	27.00
Third page	25.00	22.00	20.00
Quarter page	20.00	18.00	16.00
Eighth page	11.00	10.00	9.00
Sixteenth page	7.00	6.00	5.00

If it can be proved that there is a page advertisement in this number of TELEPHONY at a rate less than $50 per issue, a half page advertisement at less than $27 per issue a third page advertisement at less than $20 per issue; a quarter page advertisement at less than $16 per issue; an eighth page advertisement at less than $9 per issue, or a sixteenth page advertisement at less than $5 per issue, The Telephony Publishing Company will pay to *anyone* furnishing such proof the sum of one thousand ($1,000) dollars. This offer is open to advertiser, or non-advertiser. We do not want any misunderstanding of the offer. It is open to all, and will set at rest the question of what is paid for advertising space in TELEPHONY. Every reader of TELEPHONY and every advertiser knows this publication stands for fairness. It is Independent in the broadest sense, and will treat all alike. There is but one rate for subscriptions—one rate for advertising. We give no books to subscribers as premiums. We give no inside prices to advertisers. We will stand by this policy without deviation, and believe all fair-minded men will approve it. We are grateful for the support, both from subscriber and advertiser, which has made TELEPHONY one of the strongest trade papers in the world, and the leading telephone journal of its time, and we shall try always to merit this confidence and support.

As the telephone ranks as the most widespread application of electricity in its direct relations to the individual, so the business conduct of its affairs must be administered in the interest of the subscriber as well as the stockholder.

PUMPING WATER INTO TELEPHONE STOCK.

The Chicago Telephone Company makes for 1903 what its stockholders will justly call a "lovely" showing. The gross receipts increased $964,000 and the net receipts $218,000. Notwithstanding the water poured into the capital stock during the year, the profits were 10.15 per cent on the increased capitalization. The rate of profit will not down, and further watering is to be tried. During 1904 $1,000,000 of new stock will be sold for cash at par to stockholders, and an

additional issue of $5,000,000 has been authorized to be worked off during the next two or three years. Then the capitalization will reach the highly respectable figure of $20,000,000.

It is alleged that the money received for stock has gone into the plant. It appears from the balance sheet that the sum of $12,300,000 has been put in real estate, buildings, and plant. Are the buildings and plant worth what they cost? There seems to have been nothing written off for depreciation last year or in any preceding year. It is the shopworn trick of the public service corporation to inventory its depreciated assets at original cost and claim public consideration and continued favors on account of the large amount of capital invested. Witness the case of the Chicago City Railway Company, whose assets shrank and shriveled to about two-thirds of the face value of the stock when an expert instead of a bookkeeper passed on their value.

It is the expressed belief of the management and stockholders of the telephone company that they will receive "equitable treatment" at the expiration of its term, five years hence. It is a venerable maxim that he who seeks equity must do equity. The management of the telephone company did not do equity, and showed no faith in its claims to favorable consideration when it sought to obtain a new long term franchise by clandestine means through a Hyde Park company. That move, which was defeated, did not indicate a desire to deal fairly and above board with the municipality.

If the company wishes to be dealt with in a friendly spirit five years hence it will give "equitable treatment" to its patrons. It does not do so now. It swells its revenues by charging high rates for service which is poor. It exacts toll charges in Hyde Park and Lake, which should have been abandoned long ago. It takes out of the pockets of the public all the law allows it to, and as much more as it can. That is not the way to bid for "equitable treatment."

The telephone company, unless it mends its ways considerably, which, probably, is impossible and inconceivable for its managers, will be dealt with when its franchises expire in a spirit of justice untempered by mercy. It will not be treated with special tenderness because it has a capitalization of $20,000,000, which at that time will be largely water. It will be treated according to its deserts, which thus far are small.

The development of cheaper classes of service for those who have cause for the infrequent use of the telephone, is a long step towards its universal use.

THE PASSING OF THE KELLOGG COMPANY.

Nothing has hurt the Kellogg Switchboard and Supply Company so much as the publication of the Faris letter in the February TELEPHONY. Letters have been received by this publication from all parts of the country, commending our stand against the Bell company's attempt to enter the Independent telephone manufacturing field, under the guise of an Independent concern. When the first expose of Bell ownership of the Kellogg company was made, it seriously interfered with the plan mapped out by the Bell company, which for treachery and dishonor, has not been equaled in any country's commercial history.

The Kellogg company has dug its own grave. Its present position in the telephone field is farcial, and its Bell owners know it. They also know that the coup they so carefully planned has miscarried and left the company in desperate straights. A Kellogg man told the editor of this publication that the company had lost practically all of its business from the medium sized and small exchanges, and its only orders were for renewals from some of the large exchanges, who unfortunately were compelled to buy Kellogg apparatus at least for the present.

This is as it should be. No self-respecting Independent will patronize the Bell company and furnish it the sinews of war to be used against the whole Independent movement. The Bell has ever been the enemy of telephonic progress, and its hatred of Independent telephone men has been implacable. The Bell stands for monopoly, greed and oppression. The Independent movement is a protest against Bell methods, and has for its object the universal use of the telephone. It is too strong and powerful for the Bell to reach. Independents fight for a principle and for the people. What silliness it is to talk of the Bell absorbing the opposition. If the true facts were known it would be found that the Bell is bankrupt and could not absorb anything, except some more water in its already submerged stock. The Independent exchange owner has no use for the Bell and he has no use for the Kellogg, which is Bell.

The Kellogg race is run, so far as Independents are concerned, and the company might just as well shut up shop and quit.

The telephone transmits in miniature the infinitesimal overtones which indicate the character of sounds, the individual quality of a voice or the source of a tone, through the whole range of vibrations far beyond the limits of the human ear.

DECLINE OF BELL STOCK.

The stock of the American Telephone and Telegraph Company was recently quoted on the New York Stock Exchange at less than 120. This is the lowest this stock has reached in the history of the organization, and it looks very much as though investors were avoiding Bell securities. One does not have to go far to find reasons for this steady decline in Bell stock. The instrument output statement of the American Telephone and Telegraph Company for the month of December, 1903, shows:

Month of December.	1903.	1902.	Inc.
Gross output	88,947	92,732	*3,785
Returned	39,678	34,688	4,990
Net output	49,269	58,044	*8,775

*Decrease.

From this statement it will be seen that for the month of December, 1903, the gross output of Bell instruments was 3,785 less than for the month of December, 1902, while the instruments returned in December, 1903, were 4,990 in excess of the amount returned in December, 1902, showing a loss of 8,775 instruments for last December over the corresponding month of the preceding year. In other words, the Bell company in December, 1903, put out nearly nine thousand less instruments than it put out in December, 1902. This statement, of course, does not look good to Bell stockholders, and certainly is not one to invite investors.

Another reason for the decline of Bell stock is that the licensee companies, in many cases, refuse longer to pay royalty on an expired patent. Some of the licensee companies are bankrupt and cannot pay a royalty if they would. It is becoming difficult for the American Telephone and Telegraph Company to raise new money, and all around the outlook from the Bell side is gloomy. The Boston Post of recent date says: "The American Telephone and Telegraph Company has always had a big and unique problem on its hands. With each succeeding year the problem grows bigger to the company and more interesting to the public. The question is how to raise funds. That sounds simple enough but when one considers that the capitalization has more than doubled within the last four years, from less than $100,000,000 to nearly $200,000,000, and that it has almost all come from the limited field of New England, the nature of the problem can be more readily grasped. It is a peculiar fact that nearly all of the money for the development of the telephone business all over the country has come from New England. Even the incorporation in New York and the

listing on the New York Stock Exchange did not avail to help the situation any in this respect. New York investors have little desire to buy telephone stock. They did take a little last year when it was at its extreme low point, perhaps 20,000 shares, but this has since been sold in the Boston market again."

The Boston Post knows the Bell condition. No one outside of New England wants Bell stock and it is getting to be a serious question where to raise funds, as the New England investors are not so anxious to put money into Bell securities as formerly. It was planned to raise $30,000,000 for Bell improvements and extension this year and to buy up Independent companies. The money could not be had. It was then thought $20,000,000 would suffice. This amount was not forthcoming and the Bell wisely decided it would not need the money until fall. President Fish is on a western trip of observation. If he is an observing man he will find that there are two Independent telephones in service to every Bell telephone. He will also learn that there are seven thousand Independent telephone exchanges in operation as against three thousand Bell exchanges. It will be impressed upon him that there *is* competition and of a kind to make his company believe that the telephone is not a "Natural (Bell) Monopoly." Then when he returns East he may advise his friends to unload, and invest in Independent securities which are staple and remunerative. Whatever he does, this publication would like to have an expression from Mr. Fish concerning "the telephone outlook."

The improvements in telephony during the past year, which appeal to the interests of the greatest number of persons, have been those of celerity and accuracy of service.

THE MICHIGAN BELL HOLD-UP.

A recent issue of a Detroit paper contains a list occupying about three and one-half columns, in small type, of the 747 minority stockholders of the Michigan (Bell) Telephone Company, who were completely wiped off the slate by the sale under mortgage foreclosure of that company's property. The $1,312,700 of stock owned by these unfortunates is held mostly in Michigan and now has no other value than waste paper. Many of the plucked stockholders are women and persons of small means, and scarcely a town in the state but has some portion of loss.

This is a sample of Bell investment. There is no redress for any one of the stockholders. The Union Trust Company's expert, W. A. Jackson, who is slated for the presidency of the Michigan company, under the reorganization, stated in a recent interview:

"Here was the situation of the Michigan Telephone Company in July, 1902, when the default took place. The company had a bonded debt of about $5,000,000 in round figures, besides a smaller underlying debt. It also assumed $600,000 of the Detroit Telephone Company's bonds, and after these obligations there was a floating debt, unsecured, of about $2,400,000.

"Now, in July, 1902, on the basis of its fixed charges due to its debt, the company was losing more than $200,000 a year. A large percentage of its plants in this state, including many of the most important cities, was in a state of physical wreck. No adequate service could be rendered, and the requirement in new money at that period, to restore the property and for extensions in its territory most essential for the accommodation of the public, was in round figures $1,700,000.

"From these conditions, it will be seen that the company was a hopeless bankrupt, not meeting its fixed charges or the expense of carrying on its operations by at least $200,000 a year. More than this, the company had been in a state of bankruptcy for more than three years. About the time of the notification to the bondholders of the default, in July, 1902, a proposition was made to readjust their claims on the basis of about 35 cents on the dollar for the first secured debt. This would have involved not only a loss to them, but the continuance of the old methods and the same management.

"Bad as it may seem that a large loss should fall on a large number of innocent stockholders, their interests, long before the foreclosure proceedings were taken, had become absolutely worthless. In dealing with this question the bondholders don't know one set of stockholders from another. Their only object has been to save themselves from loss, and no one could be more sorry for the innocent stockholders who have lost their money than the bondholders themselves.

"The whole trouble was owing to the reckless and wasteful methods of those who had the management of the property up to the time of the default. Yes, I know it is claimed that the American Bell Telephone Company controlled the Michigan company through its subsidiary company, the Western, but that is not true. When the Western company took over the wreck of the Erie Telephone and Telegraph Company, only the desirable portions of its assets were purchased, and among those left out was the Michigan Telephone Company. At the time of the Michigan Telephone Company foreclosure, the American Bell owned only a small amount of its stock, something over 1,000 shares."

In view of the widespread misery and distress caused by the wreck of the old Michigan Telephone Company, some people cannot understand why such prominent and reputable Detroit citizens as John T. Shaw, Elliott G. Stevenson, Col. F. J. Hecker, W. C. McMillan, Truman H. Newberry, and others should lend their names to the company organized by the bondholders to take over the wreck. Mr. Shaw, vice-president of the First National Bank, was requested to explain their position.

"The Detroit men who have become connected with the new Michigan State Telephone Company," said Mr. Shaw, "had nothing to do with the circumstances leading up to its organization. If the old company was wrecked, if the foreclosure and sale was a gigantic swindle and freeze-out, as some people claim, the wrecking, swindling and freezing-out was done by outsiders.

"We do not know whether these charges are true or false, and in either event the facts would have no bearing on our position. For myself personally, I can say that I sold my stock in the Michigan Telephone Company years ago, when I saw that Glidden was running it into the ground. But granting that the company was deliberately wrecked, the minority stockholders have lost their stock anyhow. If we declined to have anything to do with the company they would be out in the cold just the same. On the other hand, we believe that local capital should be represented in the new company and local men should have a voice in its management.

"The telephone has come to be a necessity in business life, and if the new company can be better managed with Michigan men on its board of directors, then we are justified in taking that responsibility. The foreclosure and sale were brought about by foreigners, who controlled the old company. We are not responsible for what they did, but in becoming identified with the new company we give a guarantee that it will be managed for the best interests of all concerned."

These interviews make interesting reading for the old stockholders, especially the statement that the parent Bell company owned only a small amount of the Michigan stock, and that when it took over the wrecked Erie company Michigan was left out. The parent company had troubles of its own, so cast off its sub-licensee. The people of Michigan put up the money that was lost. The investing public has learned its lesson as far as telephone securities are concerned. Independent stock and bonds are at a premium, while Bell securities are not bought at any figure.

BELL METHODS IN CANADA.

The following is a translation from the *La Presse,* a French paper, published in Montreal, Canada:

THE MICHIGAN TELEPHONE COMPANY.

Several months ago the Michigan Telephone Company was sold on foreclosure proceedings by the bondholders for $4,100,000. The stockholders, finding themselves entirely deprived of their investment and not having received any dividends for a number of years, undertook to save something from the ruins, addressing the courts with a request to nullify the sale, but by decision of the court, rendered on December 24, the sale has been confirmed. A great many Canadians had interests in this enterprise. Detroit had three competing telephone companies, none of which met with success. The first of these companies has been introduced in Canada and even in Great Britain as a perfect gold mine, and quantities of bonds and stocks were sold in these countries upon the gorgeous promises of professional promoters. The stockholders, after vain expectation of dividends, found themselves all at once deprived of their holdings. The *Detroit Free Press* of the 26th of December comments as follows upon the situation:

"Humanity has seven stages, but the corporations of public service have only five of them. At first we have the corporation itself, filling its functions with indifference and without just consideration for public rights. Next is the stage of competition, when two corporations undertake with more or less hostilities to divide a natural monopoly. Hence consolidation, with the inevitable overcapitalization and the destruction of a large part of the assets.

"Then the company passes into the hands of the receiver and is sold for the benefit of the stockholders, and the minority of them lose their investment. Finally comes the stage of reorganization, during which the corporation undertakes to fulfil its functions normally for the moment, all elements of speculation having been eliminated. The Michigan Telephone Company has now passed four stages and is entering its fifth. The minority stockholders are left out in the cold.

"The inhabitants of Detroit and Michigan are tired seeing speculators play ball with their telephone service. They are satisfied to pay a reasonable price for a reasonable service. They are desirous to see people investing their money get a just revenue; but they have no more ambition to see people 'promoting' at their expense. They have had enough of it on that subject. They would like to see the telephone business managed the same as any other legitimate business."

This item has been published in many Canadian papers, at the instigation of the Bell company. The item conveys the idea the Michigan Telephone Company is an Independent company, and Canadians are warned against investing money in like enterprises. This Bell subterfuge is so shallow that Canadians should see through it easily. Just why the Bell company uses such methods is beyond comprehension, as they always act as a boomerang. J. F. Demars of Quebec, Canada, who sent the copy of *La Presse* to TELEPHONY states that the Bell company use it as an argument against Independent telephone enterprises. We would suggest to Mr. Demars that he gather some data as to the Independents' progress in the States, and have this published in Canadian papers. Investors would not be slow to see the value of Independent securities and the Bell would have to take a back seat in Canada, as it has been compelled to do over here.

The increase in telephone service both in numbers and in purpose, is making it a necessity which appeals to all mankind.

THE IOWA CONVENTION.

The eighth annual meeting of the Iowa Telephone Association will be held at the Savery House, Des Moines, on March 8, 9 and 10. The Iowa meetings have always been well attended and productive of good results. Charles C. Deering, secretary of the association, in his call for this meeting, says:

"We have had good meetings in the past, but this will be better; we have had a good attendance at former meetings, but this should be larger. Do your part to stir up the fellows who are not in the habit of coming. Every company in the state, big and little, should be represented. Don't get it into your head that this is a meeting for the larger companies only, or that you have nothing to gain by attending; the manufacturers' exhibits of the latest apparatus and specialties will alone make it worth your while. Come out and see what is doing.

"It is planned to have a banquet the last evening, ladies included. Don't forget. It is your duty, not only to be present, but to bring your neighbor. The membership and annual dues is $5.00."

The program for the three days' meeting follows:

"President's Address."
"The Farm Line Proposition."
"Operating a Telephone Plant as a Side Line."
"Long Distance Lines."
"Jealousy Among Independent Telephone Men."
"Shall We Establish a Clearing House."
"Automatic Apparatus from the Standpoint of Service and Operating Expense."
"Our Business Relations."
"Leased Toll Lines."
"How Can We Promote Better Feeling Among Toll Operators, Inducing Harmony, Improving Our Service, and Thus Reducing the Lost Call Record."
"Necessity of Uniformity in Toll Line Service and Rates."
"Our Royalty to the Principles of the Association."

MICHIGAN TELEPHONE CONVENTION.

The annual convention of the Michigan Independent Telephone Association was held at Grand Rapids, Mich., on February 24, 25, 1904. The meeting was largely attended and was one of the most enthusiastic in the history of the association. A complete report of this convention will be found in the April TELEPHONY. The program as carried out follows:

WEDNESDAY, FEBRUARY 24.

"An Automatic Exchange," by the exchange itself.
Address of welcome, by Mayor W. M. Palmer.
President's address, by E. B. Fisher, Grand Rapids.
"Our Experience with Farm Telephones," Dr. G. S. Root, Hart, Michigan.
"Old and New Ideas on State Clearing Houses," R. F. Johnson, Saginaw, Michigan.
"A County System, Including Rural Telephone Service," W. O. Hunt, Adrian, Michigan.
"Our Needs in Southeastern Michigan," R. B. McPherson, Howell, Michigan.
"Telephone Accountants," W. J. Melcher, Alma, Michigan.

THURSDAY, FEBRUARY 25.

"Rural Developments in Jackson County," N. F. Wing, Jackson, Michigan.
"Is the Time Right for Three Minute Service?" C. E. Tarte, Grand Rapids, Michigan.
"A City's Relation with Rural Lines," H. A. Douglass, Jackson, Michigan.
"National Situation of Independent Telephone Companies," J. B. Ware, Grand Rapids, Michigan.
"What We Are Doing in Washtenaw County," Chas. F. Speed, Ann Arbor, Michigan.

A unique banquet was tendered the Chicago Press Club by the Illinois Tunnel Company on February 10. A table one thousand feet long was spread in the Chicago tunnel, reaching from Franklin to La Salle street. Telephones were placed at different positions along the table, which were connected to the main exchange. The novelty of a banquet forty feet underground was enjoyed by all who participated.

Ohio Telephone Convention

The annual convention of the Ohio Independent Telephone Association was held at the Grand Hotel, Cincinnati, Ohio, on February 18, 19 and 20, 1904. The first day's session was called to order promptly at ten o'clock by W. Gilbert Thompson, president of the association, who made the following address:

About three months ago a meeting was called at Columbus by a number of the managers of the state and it was determined at that meeting that it was advisable for the Ohio association to have a convention. A committee was appointed to investigate and ascertain the opinion of the various managers of Ohio upon the question. The result of that committee's work indicated that over one hundred of the managers were anxious that a meeting of the state association be held.

CONVENTION HEADQUARTERS—GRAND HOTEL, CINCINNATI.

At that meeting it was further determined that the convention would be held at Cincinnati, and that Indiana and Ohio and Kentucky would participate in the convention, Indiana and Kentucky being especially invited as the guests of the Ohio association.

I was honored with the chairmanship of the meeting, and it is needless to say that I very much appreciate the honor that has been conferred upon me in being selected to preside over a convention of Independent telephone men covering such representative states. This is a convention of intelligent, pushing, energetic business men, pioneers in a movement that is destined for the great good of this entire community.

In Southern Ohio we have Cincinnati, the only city almost in the West, that is controlled and dominated entirely by the Bell opponents. We feel that perhaps the people of Cincinnati after seeing a convention of Independent telephone men, would understand something more forcibly of the things that they were missing in not connecting or associating with the business proposition possessing such managers as there are in this convention to-day. We feel that their presence here should add an incentive to the growth of the Independent telephone movement in Southern Ohio, and for that reason, possibly, this place was selected for this meeting.

I am certainly pleased to know that there are so many in attendance. Like most conventions, very few attend the first session. We have quite a lengthy and important program. It was the design of the persons who originated this convention that the work would be done in a day and therefore instead of starting it half an hour late, as it ordinarily is, I have called the convention promptly to order at the time designated in the program.

I desire to announce the committees that have been selected, and I want further to say that in the announcement of these committees I have selected men whom I expect to take care of and carry on the work.

I will appoint as the committee on credentials Thedieck of Ohio, Frazec of Indiana and Chambers of Kentucky.

I expect any one who appears before any other committee to be known to this committee, and all should present their credentials and have them vouched for before they will be heard before any of the other committees on any question that may concern this convention.

I will appoint upon the committee on legislation: James S. Bailey, Frank L. Beam and O. M. Bake.

I will appoint on the nominating committee, to select persons to preside over this association in Ohio for the ensuing year: A. H. Doudna, Bridgeport; W. H. Baum, Batavia, and L. M. Flesh, Piqua.

I will appoint on the finance committee: W. F. Crossley, Youngstown; Stanley Outcalt, Wilmington, and Wm. Hoyle, Cambridge.

I desire to say that in connection with the finance committee, a committee on arrangements for this convention has accepted donations from various Independent manufacturing concerns. The amount of these donations, and the persons who subscribed to them, will be submitted to the committee on finance, and the outlay of this convention, with duly receipted bills for the amounts, will be also submitted to their investigation and I will expect a report made at the close of this convention.

I will appoint on the press committee: Crossley, of Ohio; Matthews, of Kentucky; Barnhart, of Indiana, and Ludlow, of Kentucky.

This committee should see that the newspapers obtain a fairly accurate account of this convention.

All persons who have come from a distance and who have procured certificates should hand them to the secretary, so that they may be properly approved and thus be enabled to secure return trip tickets at the reduced fare as provided by the traffic association.

Now it was not my design to make any speech. This is a business convention. We have before us programs of the convention. We have something for our entertainment; we have something for your information and for the education of the persons present. We will have in connection with the convention a question box which will be placed at the back end of the hall, and any one who desires to have anything discussed will place the question in there and it will be taken up by the officers of the convention and read and discussions upon anything of that kind will be in order.

The first thing on the program for the morning was a paper by James B. Hoge of Cleveland, on the "Independent Telephone Situation." Mr. Hoge needed no introduction to the Independent telephone people of Ohio. His paper merited and received careful consideration.

The subject assigned to him, "Independent Telephone Situation," is one that should have been familiar to everyone, especially to those who have been in the telephone business during the last four or five years and have been in touch with the Independent telephone situation. The subject was presented in a brief way to cover the period that the Independents have been in the field. The paper appears elsewhere in TELEPHONY.

At the conclusion, and as a continuance of his paper, Mr. Hoge illustrated, by means of maps, the growth and present situation of the Independent telephone movement in the entire United States.

In the discussion which followed Mr. Beam of Columbus and Mr. Miller of Dayton took active part. Mr. Miller is a late acquisition to Independent telephony, having severed his connection with the Bell company to take the management of the Dayton plant.

The next feature of the program was a violin solo, "The Shepherd's Dance," by Mrs. Charles E. Hard. The rendition of the solo was faultless and a hearty encore followed.

The vocal solo by Mrs. William E. Hast was generously applauded and was responded to with an encore. Mrs. Samuel Crawford accompanied Mrs. Hast.

The second paper of the morning, entitled "Party Lines," by John B. Rhodes of Zanesville, was then read. This paper appears elsewhere in TELEPHONY. In introducing Mr. Rhodes the president said: "I think Mr. Rhodes needs no introduction to the managers of the states of Ohio, Indiana and Kentucky."

At the conclusion of the reading the president invited a general discussion, which ensued.

G. V. Lasher of Rutland, Ohio, made quite a lengthy discussion regarding the lines and methods of operation in Meigs County. Following Mr. Lasher W. J. Risinger of Gallipolis gave a short talk on the operations of the Gallipolis company.

O. G. Snyder of Bluffton, Ohio, said that there never was a time when the state needed a permanent organization more than it did at present, and to that end moved that a committee on permanent organization be appointed.

The motion for the appointment of a committee on permanent organization was seconded and the appointment of the committee was referred to the president, who announced that he would appoint it on the convening of the convention in the afternoon.

Morning session adjourned.

AFTERNOON SESSION.

The president announced the following committee on permanent organization: Wm. L. Cary, Jr., Cleveland, Ohio, chairman; G. P. Thorp, Wilmington, Ohio; C. B. Cokefair, Eaton, Ohio, and Morris Taylor, Rochester, Ohio. The committee was instructed to proceed with the method that it proposed for permanent organization.

The report of the committee on credentials follows:

Your committee begs leave to submit the following report:

1. Only representatives of the Independent telephone companies, manufacturers of Independent telephone appliances and other Independent representatives shall be permitted to be present at the meetings of this convention.

2. Those entitled to vote on questions of general interest shall not be restricted to the Ohio delegates. Gentlemen from Indiana and Kentucky who may be registered shall have equal representation.

3. Manufacturers or other representatives shall not be allowed to vote.

4. Only members of Ohio telephone companies shall be allowed to vote on matters pertaining to the Ohio Independent association.

5. Each Ohio company shall be entitled to one vote on questions pertaining to the Ohio Independent Telephone Association.

6. No one will be permitted to appear before any committee without first receiving the endorsement of this committee.

It was moved and seconded that the report be adopted.

The report of the committee on legislation follows:

The committee on legislation begs leave to submit the following report:

We recommend that a committee of three be appointed to oppose the passage of the bill now before the legislature of Ohio, known as House Bill No. 166, herewith attached.

Also the following: We further recommend that a committee of three be appointed to oppose the passage of the bill now before the legislature of Ohio known as House Bill No. 149, which is to regulate one price per annum for telephone service, making the maximum rate for residence three dollars per month, and business telephone, six dollars per month.

The bill referred to as No. 166 is as follows: Seventy-sixth General Assembly, Regular Session. Mr. Eley.

A bill providing for the connections of telephone lines.

Be it enacted by the General Assembly of the State of Ohio:

Section 1. That any telephone company in this state desiring to connect with any other telephone company, having lines wholly or partly in this state, so that the patrons of one line can talk direct to the patrons of the other line and shall be entitled to such connection on the following terms:

Said connection shall be made at the nearest established telephone station in this state of the company to which the connection is desired to be made from the telephone station of the telephone company desiring connection.

Sec. 2. The telephone company wishing to connect shall provide the necessary connecting line between the stations to be connected, and each station so connected shall be furnished with the necessary appliances to carry out the provisions and intent of this act, by its company.

Sec. 3. No company shall charge to patrons of a connected line a fee in excess of that charged by its own customers for similar service from said connected station to the same place.

Sec. 4. This act shall take effect and be in force from and after its passage.

The report of the committee on legislation was adopted.

Mr. Blake made a suggestion that the members of the convention aid the committee in opposing this bill by writing or calling on the members of the legislature.

Mr. Crossley, of Youngstown, addressed the convention as follows:

"I do not know whether I am out of order in making these remarks or not. There has been a report circulated to-day in the hotel, in reference to the attitude of the president of this association and chairman of this meeting, in regard to the Eley bill, and he is accused of favoring that bill to the detriment of the Independent telephone association movement. To clear up any idea that he is in favor of that bill I think it is due him the chance to state his position."

President Thompson: I thank you Mr. Crossley. I never heard of the Eley bill until I received a copy of it from Mr. Role, who was formerly my manager of the Valley Telephone Company and is now a member of the legislature in the state of Ohio. When I looked at it I thought, naturally being suspicious, that it was the work of the Bell Telephone Company. A short time after that I received a letter from Mr. George Beers saying that we might have hard work defeating the Eley bill in the Ohio legislature.

Since coming to this convention I have received a long letter from H. D. Critchfield urging me to oppose the Eley bill. I was informed by a gentleman here, that he received a telegram from Mr. Critchfield saying it was understood in Ohio, and from what source I do not know, that I was favoring the Eley bill. I learned from another gentleman of the association that the story was being circulated through the corridors of this hotel. I want to say to the gentlemen of the association that it is absolutely false and that there is no construction that could be placed upon any language that I ever used in my life that would show that I was in favor of the Eley bill.

I believe that it is entirely unnecessary for a man to refute a falsehood and I would not do it in this place because a falsehood always corrects itself. (Applause.)

A paper on "Consolidation" by Mr. Prewitt of Kentucky was followed by applause. The discussion of Mr. Prewitt's paper was participated in generally.

George Beers of Cincinnati gave a short talk on the present situation of the Independent movement in Cincinnati and stated that after the refusal of the city council to grant a franchise, the matter was taken to the Probate court of Hamilton county and is there now awaiting a hearing, which has been delayed owing to illness of the probate judge.

J. B. Rhodes also made some remarks concerning the recent order of the postmaster general, regarding the use of telephones in postoffices and read copies of the orders relating to this subject.

The report of the committee of permanent organization was received and adopted. The question of time and place to hold the next meeting were left open. Mr. Beam made an appeal for Columbus, Ohio, as the next meeting place and the time the month of May or June.

The officers of the present convention were retained.

LIST OF COMPANIES REPRESENTED.

OHIO.

Jackson County Home Telephone Co.	Jackson
Citizens' Telephone Co.	Coshocton
Farmers' and Merchants' Telephone Co.	Coshocton
Cuyahoga Telephone Co.	Cleveland
Stark County Telephone Co.	Canton
United States Telephone Co.	Cleveland
Federal Telephone Co.	Cleveland
Massillon Telephone Co.	Massillon
Youngstown Telephone Co.	Youngstown
Columbiana Telephone Co.	Youngstown
Findlay Home Telephone Co.	Findlay
Wood County Telephone Co.	Findlay
Bluffton Telephone Co.	Bluffton
Zanesville Telephone and Telegraph Co.	Zanesville
Gallipolis Telephone Co.	Gallipolis
Citizens' Telephone Co.	Columbus
Sidney Telephone Co.	Sidney
Portage County Telephone Co.	Ravenna
Lima Telephone and Telegraph Co.	Lima
Southwest Ohio Telephone Co.	Gratiot
Citizens' Telephone Co.	Fostoria
Springfield and Xenia Telephone Co.	Springfield

Home Telephone Co. ..... Hamilton
Queen City Telephone Co. ..... Cincinnati
Oxford Telephone Co. ..... Oxford
St. Mary's Telephone Co. ..... St. Marys
Star Telephone Co. ..... Ashland
Troy Telephone Co. ..... Troy
Home Telephone Co. ..... West Milton
Marysville Telephone Co. ..... Marysville
Portsmouth Telephone Co. ..... Portsmouth
Valley Telephone Co. ..... Lebanon
Eastern Ohio Telephone Co. ..... East Rochester
Central Construction Co. ..... Wasseon
Home Telephone Co. ..... Toledo
Home Telephone Co. ..... Coolville
Citizens' Telephone Co. ..... Rutland
Athens County Telephone Co. ..... Athens
Amesville Telephone Co. ..... Amesville
Kenton Telephone Co. ..... Kenton
Logan Home Telephone Co. ..... Logan
Piqua Home Telephone Co. ..... Piqua
Belmont Telephone Co. ..... Bridgeport
Urbana Home Telephone Co. ..... Urbana
Home Telephone Co. ..... Plain City
Citizens' Telephone Co. ..... Batavia
Union Telephone Co. ..... Glouster
Camden Telephone Co. ..... Camden
Eaton Telephone Co. ..... Eaton
West Alexandria Telephone Co ..... West Alexandria
Clinton Telephone Co. ..... Wilmington
Hamilton Home Telephone Co. ..... Hamilton
Darrtown Telephone Co. ..... Darrtown
Valley Telephone Co. ..... Mason
Jackson County Telephone Co. ..... Jackson
Valley Telephone Co. ..... Waynesville

INDIANA.

Hoosier Telephone Co. ..... Salem
Bedford Home Telephone Co. ..... Bedford
Germantown Telephone Co. ..... Germantown
Brookville Telephone Co. ..... Brookville
Greenwood Telephone Co. ..... Greenwood

KENTUCKY.

Old Ky. Telephone and Telegraph Co. ..... Winchester
Maysville Telephone Co. ..... Maysville
Brackin County Telephone Co. ..... Brooksville
Louisville Home Telephone Co. ..... Louisville
Fayette Home Telephone Co. ..... Lexington

ATTENDING DELEGATES.

S. C. Gilbert, S. C. Kissner, O. F. French, A. S. Hillhouse, W. B. Overly, W. J. Halloway, W. F. Crossley, G. W. Vernon, O. G. Snyder, James B. Hoge, J. B. Rhodes, W. J. Risinger, Frank L. Beam, Maxime Reber, J. H. Thedieck, H. L. Beatty, Geo. H. Metheany, N. Yenrick, William R. Fee, J. S. Stewart, T. J. Stewart, Loren Brubaker, J. C. Rhodes, J. O. Juvenal, A. R. Crawford, W. L. Cary, Jr., Harry B. Gates, J. W. Hutchinson, D. A. Clark, Howard Swartz, Geo. W. Christian, J. W. Chambers, N. E. Ligget, E. E. Knox, W. Gilbert Thompson, Edwin Matthews, Walter Matthews, J. W. Chambers, Morris Taylor, H. L. Corliss, P. S. Pogue, J. A. Armstrong, E. L. Barber, Jas. A. Brailey, Otto Barth, G. V. Lasher, C. L. Jones, W. E. Clark, J. H. Bell, F. S. Chapman, Edwin Fleddyjohn, Walter Green, H. E. Barnet, L. M. Flesh, A. H. Doudna, C. H. Marvin, Cal Liggett, W. H. Baum, J. C. Montieth, S. B. Lambert, Geo. W. Reers, B. W. Pickering, L. M. Studevant, Andrew J. Hess, Geo. S. Shanklin, C. B. Cokefair, N. H. Brubaker, O. O. Zehring, David Prewitt, John C. Shirk, G. A. Hogue, G. P. Thorpe, O. M. Bake, G. Lowe, M. L. Sternberger, James Stoops, H. P. Morrow, J. A. Yeeck, C. E. Cox, G. P. Thorp, R. H. Mathews, S. S. Outcalt, C. Y. McVey, C. E. Emrick.

LIST OF EXHIBITORS.

Western Telephone Manufacturing Company, Chicago, J. E. Keelyn; Swedish-American Telephone Company, Chicago, E. B. Overshiner, C. H. Macklin, J. A. Russell; American Electrical Works, Providence, R. I., E. H. Hammond; the F. Bissell Company, Toledo, Ohio, F. M. Knierim; Indianapolis Arm Bracket and Pin Company, Madison, Ind., J. B. Mayers; Kellogg Switchboard and Supply Company, Chicago, A. B. Kratz, G. H. Lutz; American Electric Telephone Company, Chicago, P. J. Eubanks; the Dean Electric Company, Elyria, Ohio, A. E. Barker; Standard Underground Cable Company, Pittsburg, Arthur A. Anderson, F. S. Viele; McRoy Clay Works, Brazil, Ind., E. F. Kirkpatrick; Automatic Electric Company, Chicago, J. F. Crook, A. J. Rosseau, F. H. Lucia; Lindsley Brothers Company, Chicago, J. A. Navarre; Sterling Electric Company, Lafayette, Ind., W. E. Doolittle, Fred E. Freers; Stromberg-Carlson Telephone Manufacturing Company, Chicago, P. J. Hutz, R. Brink Tyler, Geo. H. Fister; Post-Glover Company, Cincinnati, S. W. Glover, F. D. and E. L. Van Winkle, W. K. Rokobrant; Hipwell Manufacturing Company, Allegheny, Pa., H. H. Hipwell, Todd Hipwell; Monarch Telephone Manufacturing Company, Chicago, W. H. Trimm; American Electric Fuse Company, Chicago, J. A. Kenny, George A. Rodormer; Eureka Electric Company, Genoa and Chicago, Ill., Herbert Rosenow; Sebastian-Leicht Manufacturing Company, Ashland, Ky., G. W. Sebastian; Century Telephone Construction Company, Buffalo, N. Y., B. G. Hubbell; American Steel and Wire Company, Chicago, George Chandler; Kester Electric Manufacturing Company, Chicago, J. E. Goodwin; Miller Anchor Company, Norwalk, Ohio, G. H. Miller; Chicago Writing Machine Company, Chicago, F. W. Pardee; Barry & Benton, Chicago, Frank H. Barry; North Electric Company, Cleveland, Ohio, George B. Pratt; the Ermer-Hopkins Company, Columbus, Ohio, William A. Hopkins, Jr.; W. G. Nagel Electric Company, Toledo, Ohio, H. E. Adams, Ernest J. Paradis; John A. Roebling's Sons Company, Trenton, N. J., W. W. Affleck, W. P. Bowman, J. W. Brooks; Craghead Engineering Company, Cincinnati, Ohio, Thomas J. Craghead, Joseph H. Craghead; Telephony Publishing Company, Chicago, H. B. McMeal, E. E. Smith.

THE WORLD'S GREAT CAPITALS.

In view of the fact that of the largest cities in the United States, England, Germany, France, Austria and Russia, respectively, New York is the only one that is in the grasp of a private monopoly, the following tables showing the

FLAT RATES.

CITY	Population	Operated by	Annual Rate
Paris	2,500,000	Government	$60.00
Vienna	1,400,000	Government	40.90
St. Petersburg	1,200,000	Municipality (System under construction)	28.00

MEASURED RATE SERVICE.

Number of Calls Allowed in One Year	† Greater New York Pop. 3,500,000		‡ Greater London Pop. 7,000,000 Telephone area 634 sq. miles		* Berlin Pop. 2,000,000	
	Annual Rental	Extra Calls Each	Annual Rental	Extra Calls Each	Annual Rental	Extra Calls Each
	$	Cents	$	Cents	$	Cents
600	75	8	36.35	2	29.91	3½
800	87	8	40.35	2	31.41	3¾
1,000	99	8	44.35	2	32.81	3¾
1,200	111	7	48.35	2	34.41	3½
1,500	126	7	54.35	2	36.46	1½
1,800	141	6	60.35	2	37.96	1½
2,100	153	6	66.35	2	39.46	1½
2,400	165	5	72.35	2	40.96	1½
2,700	174	5	78.35	2	42.46	1½
3,000	183	5	82.79§	.....	43.75	1½
3,300	192	5	82.79§	.....	45.25	1½
3,600	201	5	82.79§	.....	46.75	1½
3,900	210	5	82.79§	.....	48.25	1½
4,200	219	5	82.79§	.....	49.61	1½
4,700	228	5	82.79§	.....	52.04	1½
Unlimited	240	.....	82.79§	.....	55.90	1½

§The unlimited rate for second and subsequent connections is $68.18 per annum.
†"Bell" monopoly.
‡Joint service. Post Office and the National Telephone Company. Rates fixed by Postmaster General.
*Government monopoly.

comparative cost of telephone service in these cities furnish a strong proof of the necessity of an Independent system in New York.

The Schenectady Railway Company, Schenectady, N. Y., will install a system of telephones on its Troy and Albany interurban lines in a short time. These telephones will be placed in the cars running on these divisions, and will be so arranged that communication may be held with the office in Schenectady at any point along the line. The system will be simple and comparatively inexpensive. Two ordinary telephone wires will be strung the entire distance along the tracks. Each car will be provided with a telephone of the hotel type, which is compact and requires little space. These telephones will be placed inside the car, near the door, and will be connected with wires to a jointed rod long enough to reach to the wires on the poles beside the tracks.

In order that communication may be established with the office, it will be necessary to put the rod together and hang it upon the two wires by means of two hooks which are connected with the wires leading to the telephone.

DIGEST OF TELEPHONE PATENTS

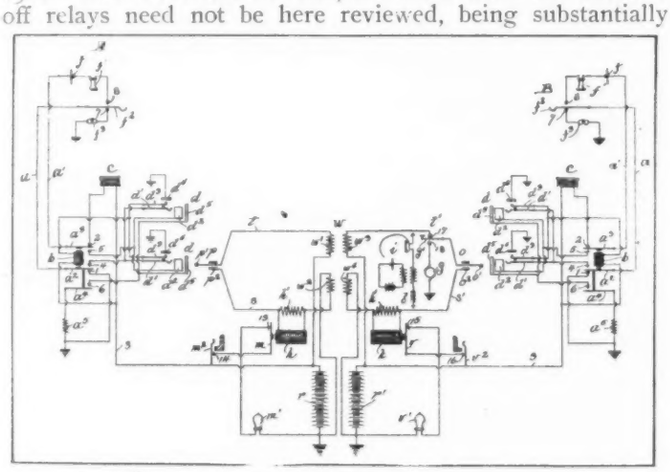
Conducte by Edward E. Clement

749,792.—Method of reproducing electrical variations. P. C. Hewitt.

This patent is the twin of 749,791, and covers the method as distinguished from the apparatus.

749,798.—Central energy telephone system. K. B. Miller.

This invention is based on one form of the Kellogg standard common battery system, and relates particularly to the supervisory signals. The application was filed Dec. 19, 1900. The subscriber's circuit, the line and the line and cut-off relays need not be here reviewed, being substantially



749,798—CENTRAL ENERGY TELEPHONE SYSTEM.

the same as those in use, due to Mr. Dunbar and Mr. Miller. The cord circuit has the repeating coil w, and the two batteries r and r', each bridged between the two separated halves w'-w² or w³-w⁴ of the coil w. Each side of the cord has a supervisory relay h or k, shunted by resistances h' and k' for talking currents. The supervisory lamps m' and v' are lighted when the relays are deënergized, that is, when the subscribers have hung up. If no other means were provided for controlling the lamp circuit it is evident that the lamps would light when the cords were not in use. To meet this contingency Mr. Miller provides plug seat switches m² and v², included in the lamp circuits, and opened when the plugs are in their seats. Thus the lamps are extinguished when the cords are idle.

As a modification of the series connection of the plug seat switches and the relay contacts, the latter are shown also as shunting the lamps when the armatures are pulled up.

749,824.—Telephone exchange. N. E. Norstrom.

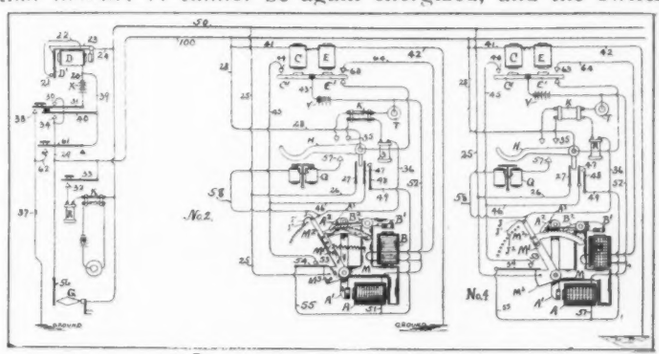
This invention relates to lock-out means for the party line selective system recently patented to Mr. Norstrom and reviewed in the last number of Telephony. The circuits at the central office and subscribers' stations need not be again described, nor the general operation. The underlying principle employed in the system is that of a step by step selector at each substation, so arranged that a different number of steps of the switch M² is required to connect the telephone at each substation. When one selection has been made, the switches at all the other stations are left on blank points. The idea in the present case is to prevent listening in by tampering with the switch. The invention will be understood from the operation.

Assuming that subscriber at telephone No. 2 desires to talk with No. 4 on the same line, he first removes his receiver, when the hook H rises, touching the contact spring 27 momentarily, but passing over it just before the hook is all the way up.

A current then flows from the battery X at central office to 20, D, 22, 21, D', 23, 24, 50, 25 of telephone No. 2 to 26, 27, H, 28, 100, 29, 30, 31, X. This operates the drop D at the central office to call the operator. By pressing key 33 the operator is then in telephonic connection with the subscriber at telephone No. 2 and can inquire what subscriber is wanted. The talking-circuit is from the induction-coil at the central office to K, R, 32, 33, 100, 28, H, 35, K, R, 36, M², M', M³, 25, 50, K at the central office.

The subscriber then hangs up his receiver until again called by the operator, or he may hold the hook H down by hand. The operator then presses key 31, when current flows as follows: Ground at central office to 37, 38, 31, X, 20, 39, 40, 34, 29, 100, 28 of each station to 41, C, E, 42 to ground at the several local stations. This operates the magnets C, closing the armatures C' to the contact-points 44, when in each station a current flows to Y, 43, C', 44, 45, 46, 47, 48, 49, 51, A, 52, Y. This advances each contact-arm M² one step and is repeated until the contact-arms are all on the second contact-point, when the operator turns her generator-crank, and the current flows as follows: G, 56, 29, 100, 28, H, 57, Q, 58, J, J', J², M², M³, 25, 50, G.

This calls the calling subscriber, who again takes down his receiver thereby breaking connection between 47 and 48, so that magnet A cannot be again energized, and the switch



749,824—TELEPHONE EXCHANGE.

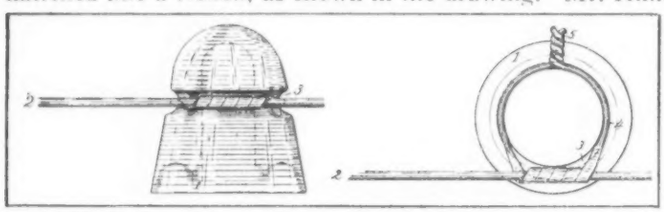
arm M² cannot be moved beyond point J², to which is connected wire J'. The operator then presses key 31 again, advancing all other contact arms on the line to the fourth point, when she again uses the generator, calling subscriber No. 4. The talking circuit is as follows: K of No. 2, to R, 36, J', M², M', M³, 25, 50, to 25 of telephone station No. 4, to M³, M', M², J, 36, R, K, 35, H, 28, 100, back to 28 of telephone station No. 2, to H, 35, K. By pressing key 33 the operator at central can listen into the talking circuit, and thus determine when the subscribers are through. She then presses key 61, when the current flows as follows: Ground at the several local stations to 42, E, C, 41, 100, 29, 30, 31, X, 39, 61, 62, 37, to ground at the central office.

This reverses the direction of the current through the magnets C and E, thereby energizing the magnet E and moving the armature E′ into connection with the contact-point 63, when a current flows as follows at each local station: Y, 43, E′, 63, 64, B, 52, Y. This releases the pawls from the quadrant and permits the contact-arms M^2 to return to their normal position.

Now, if a subscriber should attempt to prevent his contact arm from moving to one of the points which is not connected to the normal contact, the first closure of key 31, which energizes magnet C, and thereby closes the circuit through magnet A, will send current as follows: Y, 43, C′, 44, 45, 53, 54, 55, 51, A, 52, Y. As soon as the contact arm is moved one step the connection is opened between 53 and 54, and consequently the contact arm of the subscriber who has removed his receiver to listen in is left with the arm at a blank connection, in which case he is of course out of connection.

749,867.—Method of securing electric wires. A. Kline.

This is entitled a method, but it is really a tie-wire. The invention consists of a tie-wire having its middle portion flattened like a ribbon, as shown in the drawing. Mr. Kline

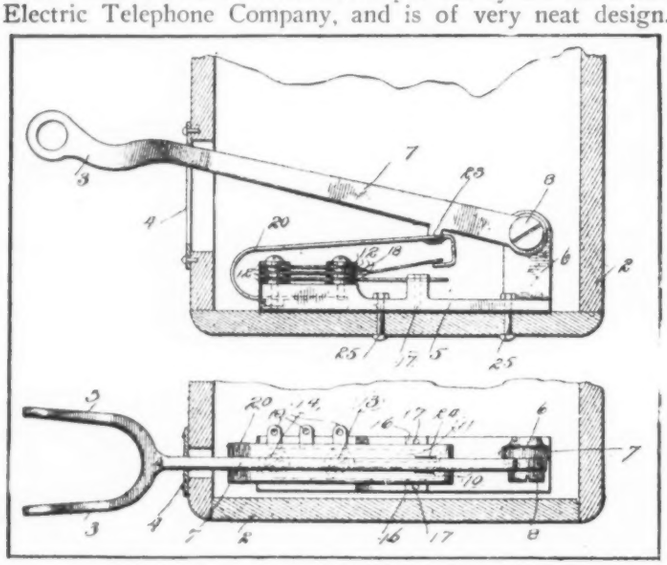


749,867—METHOD OF SECURING ELECTRIC WIRES.

says that his long experience has satisfied him that 95 per cent of the breaks in line wires is due to cutting or scratching the wire with the pliers in swinging the latter around to make the coil of the ordinary tie. With his wire, no tool approaches the line wire, the twist 5 being on the opposite side of the insulator therefrom.

749,977.—Telephone hook switch. E. E. Yaxley.

This is one of the switch hooks put out by the American Electric Telephone Company, and is of very neat design.



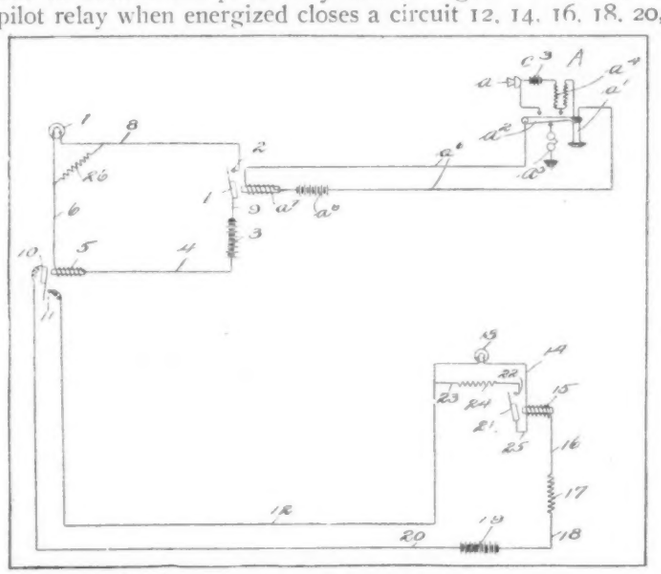
749,977—TELEPHONE HOOK SWITCH.

The cast base 5 carries the lifting spring 20, all the contact springs 12, and a lug 6 to which the hook lever 7 is secured by the regulation shoulder screw 8. The lifting spring 20 is bent around under the base and is secured by one of the same screw bolts that secure the contact springs, the latter being carried on the top of the base and separated by insulating washers. Bushings are not used, the openings in the springs being large enough to clear the screws. Connections are made to tails coming out on the side, and the contact springs are moved by the bent end of the lifting spring 20, a lug on the hook lever working in a punched depression 23 therein.

749,982.—Electrical signalling system. H. P. Clausen.

This is a scheme for causing the instantaneous and certain illumination of a pilot lamp on the chief operator's or monitor's desk even with only a very short closure of the circuit.

In the figure A is the subscriber's station, with line a^6 having a relay a^7 at central controlling the local circuit of a signal lamp 7 and a pilot relay 5. The lamp 7 is provided with a shunt 26 so that in case the lamp is burned out or broken the pilot relay will still get current. This pilot relay when energized closes a circuit 12, 14, 16, 18, 20,



749,982—ELECTRICAL SIGNALING SYSTEM.

containing a battery 19, relay 15, and pilot lamp 13. Mr. Clausen says that quick movements of the subscriber's hook switch will not always light the pilot lamp, particularly if the line lamp 7 is burned out. This is because the voltage in the circuit 12-20 is usually only sufficient for ordinary continuous lighting, and the filament of the lamp requires an appreciable time to get up to full candle power. He says that a much higher voltage can be used to bring the lamp up to a bright glow instantly, provided some means are employed to prevent the subsequent burning out of the lamp.

Supposing the lamp 13 to be a 12-volt lamp, he makes the battery 19 a 40-volt battery, puts in a limiting resistance 17 that will pass a sufficient amperage for two lamps, and connects the relay 15 so that it will pull up the instant current passes and close the shunt 23, 24, 22, 21, 25. Thus in any event the lamp will light. If the circuit is held closed the shunt prevents a burn-out.

749,989.—Cable clip. O. C. Hoffmann.

A cable clip of the well-known strap type. The hook is formed from a single piece of wire with a bent traveler. Application of the device is very simple.

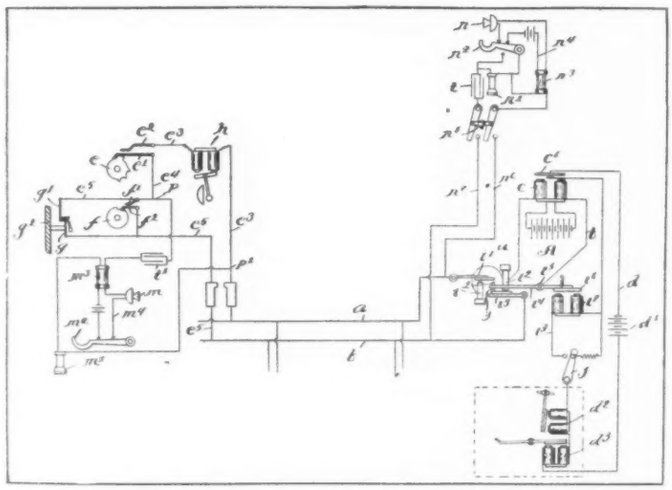
750,132.—Electromagnet. I. A. & E. W. Timmis.

These gentlemen are subjects of the King of Great Britain, and their attorneys are Connolly Bros. Thus do the scions of two noble races meet in the peaceful realm of scientific invention, and mutually aid each other. The name of Timmis was intimately associated with the electromagnet, in fact with a magnet of this same general appearance, some ten or more years ago.

The invention consists of an electromagnet carrying a helix of wire, and having a tapering central cavity and a tapering external surface.

750,268.—Electric signalling apparatus. W. E. Decrow.

Mr. Decrow is better known as an inventor in fire alarm and police telegraph "circles" than among telephone men. He has produced many valuable systems, however, with which telephones have been incorporated. In the present case his aim is to produce an open circuit system which will have all the usual capabilities of the regulation closed circuit system. In the diagram a-b is a police circuit running from the central office A to a number of street boxes constituting substations. Usually these are connected in series, but in this case they are put on in multiple like the ordinary party line telephone station. At the central office a normally open metallic branch n^6-n^7 goes to the operator's telephone set n-n'. Connection is also made to the terminals i' and i^3 of a pole changer whose lever i^4 is controlled by the magnet i^7. Included in the circuit through the pole changer is the relay c, controlling the recorders or registers, and the battery. When the switch j is thrown



750,268—ELECTRIC SIGNALING APPARATUS.

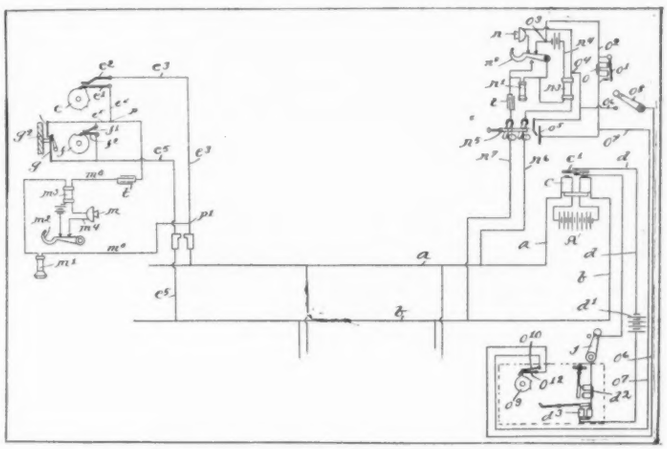
to the left the pole changer reverses the current on the line, sending a pulse of current to operate the answer-back bell h at the box. g^2 is the box door, which controls a normally open circuit closer g to cut in the signal wheel e and the telephone set when the door is opened.

The operation is as follows: A policeman opens the door and "pulls" the box. This starts wheel e, which sends impulses of current through the line and thereby indicates the number of the box, at central. If the call is for a telephone message, the receiver is then taken down after the answer-back signal has been received.

The motive for this invention is apparent. The bulk of the fire alarm and police telegraph business is in the hands of the Gamewell Company, and they naturally desire to hold it. Telephones are becoming more necessary every day, however, and the typical telephone circuit is a bridged one, as distinguished from the series circuit of the telegraph system. Hence this and many other combinations.

750,269.—Electric signalling apparatus. W. E. Decrow.

This is a system similar in its general features to the one just described. The main differences are that there is no separate bell at the substation, the telephone receiver being used to receive the answer-back signal. At the central office the telephone is cut in by switch n^5 as before, but this switch can be pushed far enough over to close together contacts o^5 in the circuit of a buzzer o, connected to the primary of the telephone coil n^3. This will send a signal to the substation receivable in the ordinary telephone receiver, which it will be noted is always connected when the box door g^2 is open. The transmitter circuit alone is controlled by the hook, and in case of trouble with the box door switch an auxiliary switch f keeps the circuit closed as long as the signalling train is running.

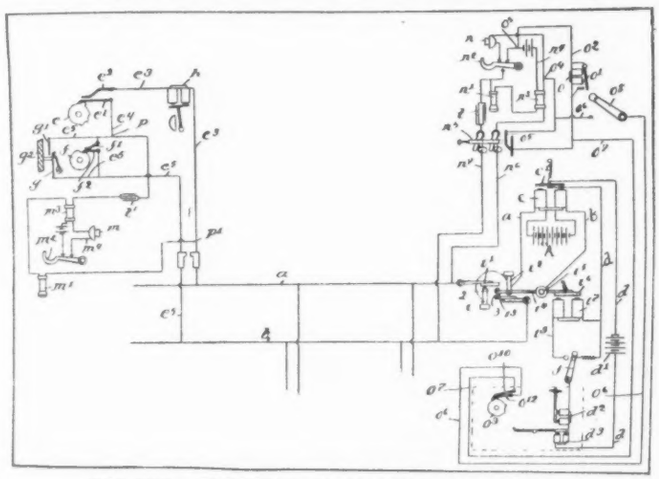


750,269—ELECTRIC SIGNALING APPARATUS.

As a special signal to indicate that the telephone is to be used, or the like, the wheel o^9 at central can be connected to the telephone circuit by switch o^8.

750,270.—Electric signalling apparatus. W. E. Decrow.

This is a system combining the features of the two others that have just been described. Its claims all specify "two



750,270—ELECTRIC SIGNALING APPARATUS.

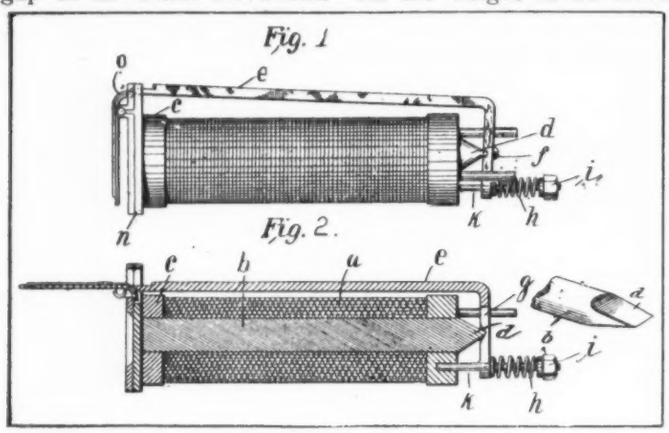
answer-back signals," one being the bell h, and the other the telephone receiver m'.

750,309.—Annunciator. L. Schmidt.

Some of the old telegraph people would turn in their graves if they could see the liberties that have been taken with the good old established forms of signal appliances such as relays and annunciators, since telephone men "got next." The multi-spring tilting armature relay looked like a freak at first, and so did the armature balanced on a knife-edge, but they have both come to stay.

Mr. Schmidt makes his annunciator in a way that would not be recognized by his brethren in Hanover. It embodies good points, however. The end of the core b is sharpened to a knife edge to take the armature e, which is controlled from the magnetic spool head c. The retracting spring is carried on one pin k, with an adjusting nut i; while a second pin may be set above, or a screw f may limit the motion of the armature. The drop o is moved by the tip of the armature lever as shown, and the question might arise as

to the efficiency of the instrument with such a large air gap at its initial movement. As the weight to be lifted

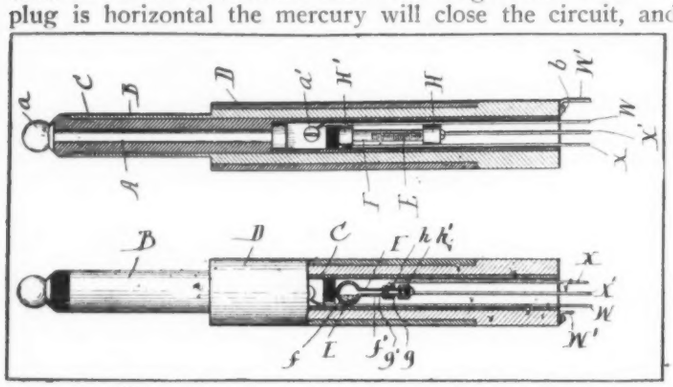


750,309—ANNUNCIATOR.

is then a minimum, however, this may not be so serious an objection as would appear at first glance.

750,689—Plug for telephone switchboards. F. D. Pearne.

This is a switchboard plug apparently requiring a four-conductor cord, and containing a tube full of mercury, with contacts in the ends of the tube so arranged that when the plug is horizontal the mercury will close the circuit, and

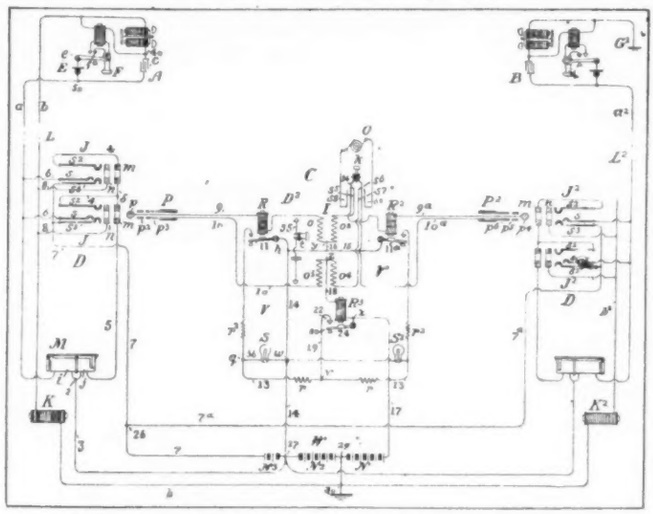


750,689—PLUG FOR TELEPHONE SWITCHBOARDS.

when the plug is certical the circuit will be opened. I presume this is intended for use to control the supervisory signal circuits on a common battery board. Unfortunately there are several drawbacks to the scheme. With jacks down to 3/8", and less, most manufacturers are desirous of cutting down the size of their plugs, not of increasing it. Again, with a few dozen glass tubes full of mercury being roughly handled all the time, on the switchboard, it would appear there would soon be work for the bug-killer.

750,704—Telephone switching and signalling apparatus. M. C. Rorty.

Prior to the introduction of the common battery system of current supply and the "relay switchboard," now universally used by the Bell and Independent companies alike, the Bell company had many installations employing what they called "branch terminal switchboards" working in magneto systems. In these boards the annunciators were permanently connected to line, but when a plug was inserted a local circuit was closed through a disabling coil of the corresponding annunciator to prevent its operation. The purpose of the present invention is to apply common battery to these branch terminal switchboards. At the subscribers' stations the old magneto instrument sets are removed and the regulation common battery sets substituted. The jacks and drops on the switchboard are left unchanged, but new cords are put on, each having two conductors and connected to the usual bridged repeating coil I and main battery W. This battery has its middle point grounded, so that while metallic circuits will have the entire battery bridged, grounded circuits will only get one-half thereof. The inner thimble n of each jack is connected through a coil K or K^2 to ground at 30, and the supervisory lamps S and S^2 are connected with a common return 19 controlled as to its battery connection 17 by relay R^3 connected on one side to the wire 17 and battery, and on the other side to the sleeve side of the cord. Whenever a plug is inserted relay



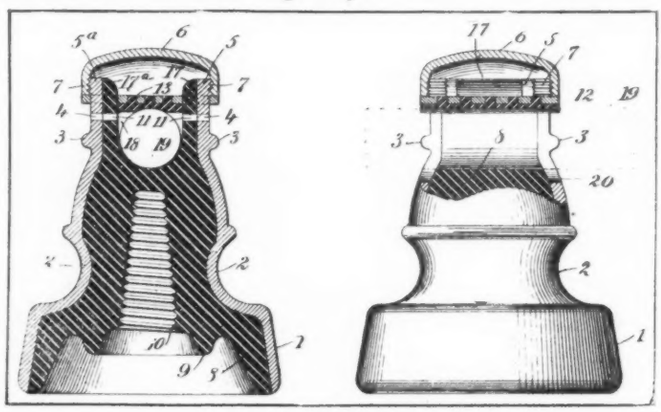
750,704—TELEPHONE SWITCHING APPARATUS.

R^3 gets current over a circuit from battery through the cord to the sleeve p^3 of the plug, to thimble n, to the coil K and ground or battery. The supervisory lamps are thus connected to battery only when the cords are in use. The supervisory relays R and R^2 act to shunt the lamps in the usual way when the subscribers' hooks are up.

The ring p^2 on the plug P, and the corresponding ring on any plug acts to connect the springs s^2 and s^3 in a jack when inserted, thus putting battery N^3 in circuit with the corresponding annunciator disabling coil j.

750,722—Insulator. L. Steinberger.

This is an insulator for holding cable. It has a metal shell 2, with an insulating body 8. The cable is laid in a



750,722—INSULATORS.

transverse slot across the top of the insulator, an insulating saddle is laid on it, a metal bridge 15 is laid on that, and a screw cap 6 holds the cable in position.

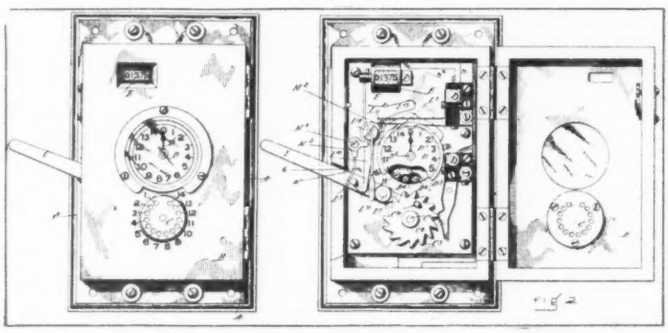
750,769—Telephone service apparatus. U. S. Jackson.

This is another step by step selective lockout apparatus for party lines. A normally unwound clockwork is employed at each station, with a lever L to wind it up and start the device at will. Figure 2 shows the apparatus at rest. A pivoted hook L^{10} lies in position to engage and

hold a pin L^3 on the operating lever when a call is made at another station, to hold the apparatus inoperative.

A pivoted bent lever N also lies in position to be turned by a coiled spring N^3 on its pivot, to turn up when released by a downward movement of pin L^3 on lever L, to engage and close the springs H^1 H^2 together and so close the talking circuit.

On the front of the box is a circular plate C with a series of holes around its periphery to receive a pin for selecting. This pin is long enough to extend through into the path of a stop pin on the toothed wheel C^2, which transmits the

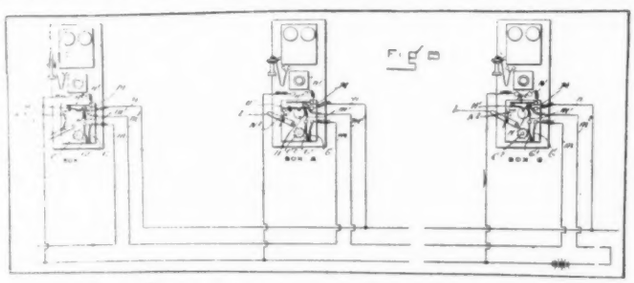


750,769—TELEPHONE SERVICE APPARATUS.

signal desired; the extent of the movement of wheel C^2 and the number of impulses transmitted being thus determined. A wheel D^3 is carried on a central arbor and carries a series of pins D^4 around its edge, which are to engage and hold up the lower contact spring H^1 when the proper station is selected. The position of the pin that will hold up these talking circuit springs at each station is different. On the front of the box the arbor of wheel D^3 carries an indicating hand so that the user may see that the proper station is called.

In addition to the selecting apparatus Mr. Jackson provides a register E at each station, operated by a connection with the lever L.

In operation suppose station 1 desires to call station 6, in the diagram. He puts the stop-key into the hole No. 6 in the disk C. Then he depresses the lever L. (The levers L of all the boxes are free when the pointer-hand is on "o.") That action at once frees the lower end of the bent lever N N^2 and allows the spring N^3 to throw the end N^2 upward, thus closing the circuit through the telephone-electrodes H' H^2 and thence the telephone-circuit itself. A continued depression of the lever winds up the actuating-spring and causes the notched contact-wheel C^2 to rotate. This wheel will continue to rotate until the pin C^4 on it comes in contact with the stop-key—that is, until six of the points C^3 of the notched wheel C^2 have come in contact with the



750,769—TELEPHONE SERVICE APPARATUS.

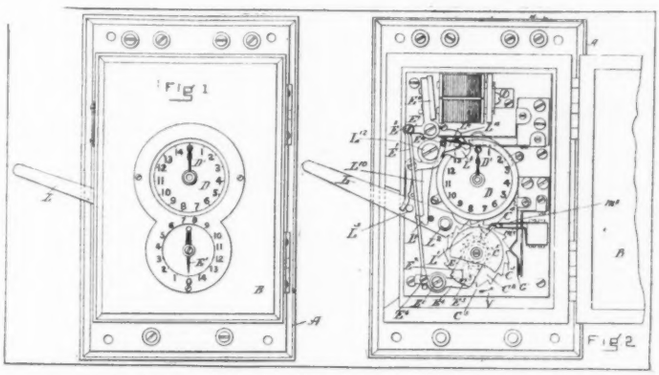
electrode G' six times—thus making six breaks and contacts, and as each make and break, acting through the circuit m m' m^2, (see Figs. 3 and 6), will charge and discharge the magnet M it follows that the double-pawl lever M^3 will have operated in all the boxes and set all of the trunnion-pinions D^3 ahead six numbers. This action will cause the pin H of box No. 6 to close the telephone-circuit for that box and enable No. 1 to communicate with No. 6, as desired. It will be noticed that although all of the levers L of the boxes are free when none are in use as soon as a lever in any one box is depressed it will start the pinions D^3 of all of the boxes, which will cause the boss L^8 to move from under the end L^{11} of the lever L^{10} L^{11}, and thus allow them to hook onto their respective pins L^3 and at once lock all of the levers L.

To restore the apparatus to its normal condition, the user withdraws the stop-key C^6 from the hole in the disk C. This action allows the movement of the several parts to continue until the pin C^4 on the notched contact-wheel C^2 comes in contact with the end L' of the lever L-L' and the pointer-hand is on "o".

750,770—Telephone service apparatus. U. S. Jackson.

This is an improvement on the apparatus previously described. The improved parts relate exclusively to the user's control of the service apparatus while he is talking, and with telephone receiver in his hand with one finger of the same hand upon a push button on the receiver he controls the entire system; but he controls it only so long as he holds the receiver with his finger on the button. When he lays down the receiver or takes his finger from the button all the apparatus assumes its normal condition—that is, all the boxes will be ready for use, with all the levers L unlocked.

The user's first act is to depress the lever L of his box. As soon as this is done it will start the whole mechanism of all the boxes, which will cause the boss L^8 to pass out from



750,770—TELEPHONE SERVICE APPARATUS.

under the end L^{11} of the locking-lever, and thus allow the hook L^9 to swing into locking engagement with the pin L^3 on the winding-up lever L, thus locking it in all of the boxes except the one from which the call is made. The same movement will cause the pin C^4 to pass out from under the electrode m^8 and allow it to make an electrical contact with the electrode m^7, Fig. 8, and thus close the circuit of the magnet M and cause the armature E^{11} to be drawn to the magnet. This action will cause the arm E^9, which swings on the pivot E^{10}, to act through its pin E^8 and draw up the link E^7, which acting through the pin E^6 causes the hook-lever E^4 to swing on its pivot E^5, and thus frees the arm E, which has the pawl E^2 attached by the pin E^3, the hook of the lever E^4 engaging with the extension of the pin E^3 when the mechanism is in the position illustrated in Fig. 8; but when the magnet is energized—then the hook of the lever E^4 is not in egagement with the pin E^3 of the pawl E^2. Now the user by taking hold of the handle H, that is attached both to the pointer E' and to the plate E, may turn the said plate and pointer to the desired position—that is, so that the pointer E' will point to the number of the box to be called—"6," for instance. This action will carry the pawl E^2 around to "6," and as the notches on the pawl-wheel C^5 are the same in number and correspond to the contact-points C^3 C^3 on the wheel C^2, to which the pawl-wheel C^5 is rigidly attached, it is obvious that when the said wheel C^2 has rotated (in the direction of the arrow V) so as to make six contacts of its points C^3 with the make-

and break electrode G', Fig. 2, then the pin E^3 of the pawl E^2 will have returned to the position shown in Fig. 8—that is, so that it will be stopped and held by the hook of the lever E^4—and Box No. 6 will be put in electric communication with the box of the user. So long as the hook of the lever E^4 holds the plate E and the contact-wheel C^2 in this position the user may talk with No. 6. The arrangement is such that whenever the magnet M is not energized the hook of the lever E^4 will be in its locking position.

The receiver in this case has a spring contact in its shell,

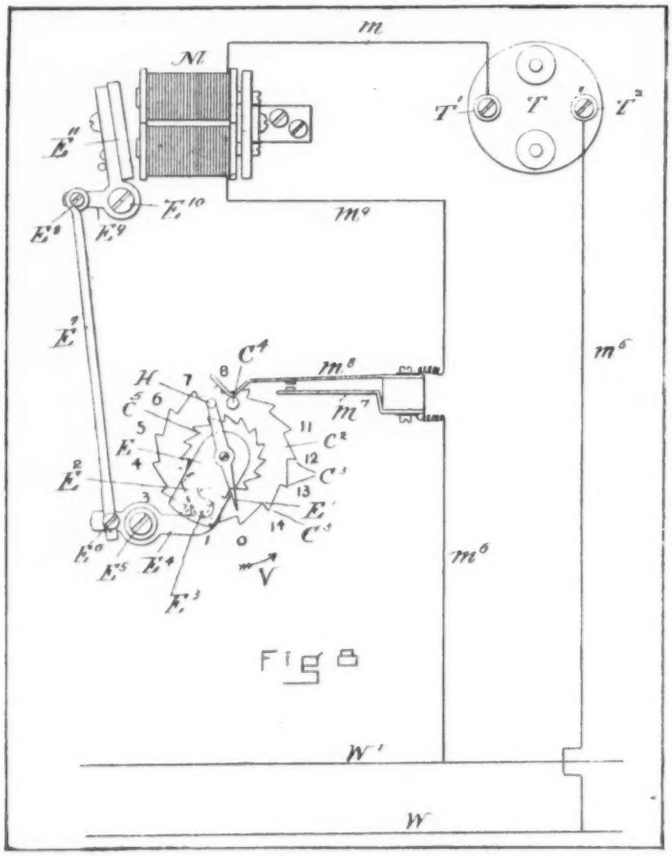


Fig 8

750,770—TELEPHONE SERVICE APPARATUS.

with a push button coming out in position to be worked by the hand that holds the instrument. A pair of extra conductors in the cord are connected through binding posts T' and T² on the receiver to the spring contacts, and outside to the magnet M to the battery wires W and W'. When the push button is not depressed the circuit is closed, the magnet is energized, and the hook lever E^4 is drawn away from the pin E^3 of the pawl E^2, thus allowing the contact wheel C^2 to rotate; but when the push button is in then the circuit is open, the magnet is de-energized, as shown in Fig. 8, and the contact wheel C^2 is locked. When the user has finished his conversation, he releases the push button, the magnet unhooks the lever, and the wheel C^2 returns to its normal point to readjust all of the mechanism ready for further use.

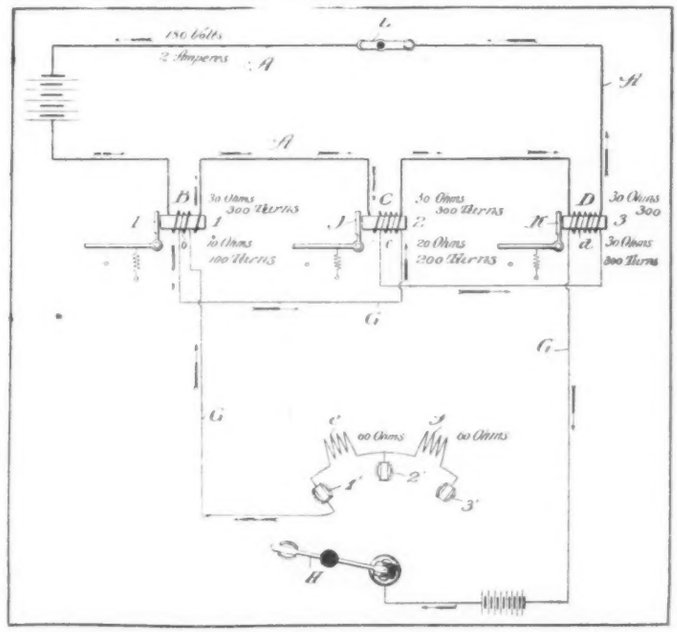
750,777—Apparatus for selective signalling. K. Moodie and J. S. Small.

This system is based upon the idea of having a number of magnets connected to the line and normally energized, and means for neutralizing one magnet at a time by producing variations in the amount of current flowing through secondary coils. Thus in Fig. 1, the circuit A is normally closed through all three of the magnets B, C and D, as regards what may be called their primary windings. These windings are uniform, and the magnets are all normally energized, holding up their armatures. Each magnet has a secondary winding, b, c, or d, and these secondary windings are connected in an operating circuit G, containing a selecting switch H by which more or less resistance can be included in this circuit.

With the parts as shown in the figure, which is the normal position, assume for illustration that each of the windings B, C and D has 300 turns and an ohmic resistance of 30. Disregarding and additional incidental resistance in the circuit the total resistance in the circuit will be ninety ohms. If we now supply the circuit A with a current at one hundred and eighty volts, it follows that with a total resistance in the circuit of ninety ohms we will have a current of two amperes, which will give us six hundred ampere-turns in each of the helices B C D.

Assume that each of the windings or helices b, c and d is different, the first having 100 turns with 10 ohms resistance, the second 200 turns with 20 ohms resistance and the third 300 turns, with 30 ohms resistance. This gives us a double resistance of 60 ohms.

If now we close the switch H to contact 1', and thereby supply the circuit G with a current of three hundred and sixty volts, we will have a current of six amperes in the operating-circuit. This current of six amperes, passing through helix b, having one hundred-turns, will give us six hundred ampere-turns, which will exactly neutralize the six hundred ampere-turns in main-circuit helix B, which has three hundred turns and is supplied with a current of two amperes. It follows, however, that the operating-current of six amperes supplied to helix c, having two hundred turns, will produce twelve hundred ampere-turns, which will reverse the magnetism of core 2, and the same current will



750,777—APPARATUS FOR SELECTIVE SIGNALING.

produce eighteen hundred ampere-turns in helix d, which will reverse the magnetism of core 3.

If now it be desired to release the armature J, the switch H is turned to contact 2', thereby throwing the operating current on the line with 60 ohms of resistance interposed, whereby the total resistance in circuit G is increased to 120 ohms and the amperage is reduced to 3. This current of three amperes supplied to helix b will only produce three hundred ampere-turns, which will be insufficient to neutralize helix B; but this current of three amperes, passing through helix c of two hundred ohms resistance, will produce six hundred ampere-turns, which will neutralize the effect of helix C and will release armature J, while the two-ampere current will produce twelve hundred ampere-

turns in helix d and will consequently reverse the magnetism of core 3.

To release armature K, switch H is brought to contact 3′, thereby throwing the operating-circuit through resistance-coil f of sixty ohms resistance, as well as resistance-coil e, with corresponding changes in the effect and operation of the current.

All the armatures can be thrown up at any time by opening the operating-circuit, and all can be thrown back or released at any time by opening the main charging circuit A, the operating-circuit being then also open, of course.

Several modifications of this circuit are shown in the patent, with the magnets both in series and in multiple connections. The patentees state that the scheme may be applied to telephone party lines, to printing typewriters, etc.

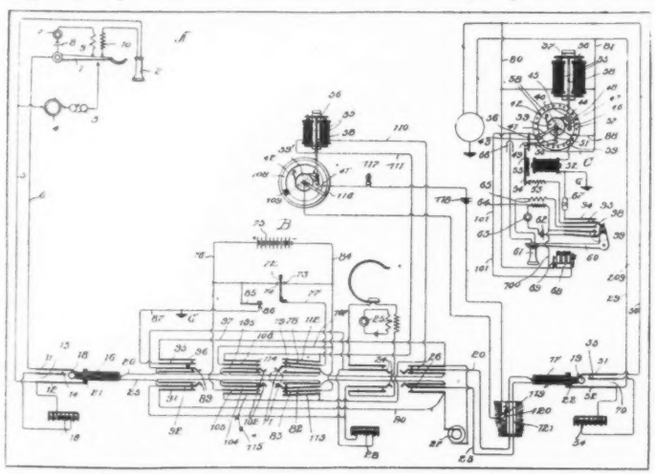
41,962—Trade Mark—Induction coils. Varley Duplex Magnet Co.

This is a trade mark adopted by the Varley company in December, 1903. It consists of the arbitrary word "Autocoil," and is intended for application particularly to induction coils.

750,793—Selective sagnalling system. G. Babcock.

This is a step by step selective signalling scheme intended to be applied to Stromberg circuits. The patent belongs to the Stromberg-Carlson Company. Reference is made to a co-pending application, No. 157,633, filed May 18, 1903, in which is shown automatic apparatus located at the central station and adapted to give the operator a positive signal in case of her failure to restore the line to its normal condition. This restoring signal is there shown to be associated with the line signalling device located at the central station, and of course special jacks are required. In the present case no special jack is required, the restoring signal device being associated with the cord circuits and not with the line.

In the diagram a magneto system is shown having a single party line on the left and a two party line on the



750,793—SELECTIVE SIGNALLING SYSTEM.

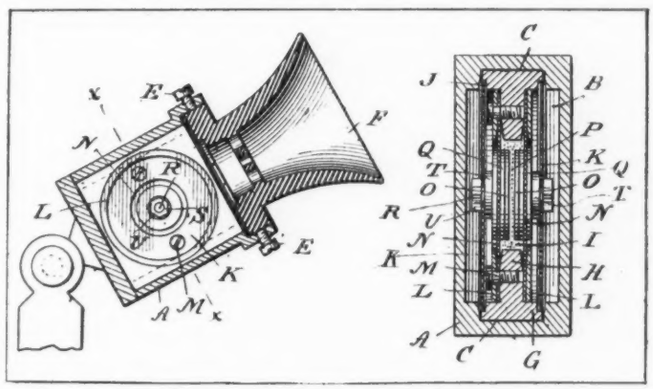
right, the second party being indicated by a grounded circle. At the station C, shown in full, the magnet 35 is permanently bridged across the line 29-30. This has a polarized armature 36 pivoted as usual at 37 and working a ratchet lever 38 which carries a pawl that moves the ratchet wheel 39. The lever 38 carries a dog 44 which works the fixed retaining pawl 46. Current through the magnet in one direction steps the toothed wheel around, and in the reverse direction lifts the pawls from the wheel and a spring returns the parts to zero. This toothed wheel carries arms 41 and 51 which control the signalling and talking circuits.

The parts in the figure are supposed to be in normal position. Suppose a call has been answered, coming from station A for connection with station C. The operator plugs in, presses over the button 71, which puts her selecting battery connections in circuit 84 on the cord, and then works the key 72 back and forth. When 72 touches 73 the line is short circuited "to cause a discharge of any static accumulation," and when it touches 74 a current impulse is sent to line over the circuit; 75, 76, 74, 72, 77, 78, 79, 20, 19, 31, 30, 80, 35, 81, 29, 32, 22, 23, 82, 83, 84, and 75. Impulses thus sent step the arms around at all the stations, but the contact pin 59 is differently located at each station, so when in the present case six impulses have gone arm 39 is on pin 59 and the arms at all the other stations are on blanks. The operator then presses key 85, which grounds the main battery, sends current through magnet 52 at substation C, pulls up armature 53, and closes the ringing circuit through the ringer 67. The ringing key 26 is then used to call the station up, and when the receiver is taken from the hook the talking circuit is completed as follows: 29, 81, 49, 54, 56, 66, 61, 65, 98, 99, 100, 80, 30.

The real invention in the present case consists in the provision of a dummy set 108 having a magnet 35′ which is connected to the cord when calling and has its arm 41′ moved off the insulated contact 109 and on to the conducting ring 116, thereby closing the circuit of a lamp 117, at one point, said circuit being open also in the seat of the calling plug at a switch there located. Now after making a selection, when the clearing out signal is given, if the operator should withdraw the plug without sending the proper reversal of current to restore the substation apparatus, and should replace it in its seat she will thereby close the second break in the circuit of the lamp 117, and her dummy set being also unrestored the lamp will light. She will then replace the plug in the jack and send the necessary current reversals.

750,835—Telephone transmitter. E. B. Fahnestock.

This is an improvement on the Fahnestock self-contained transmitter, wherein a circular chamber in a block G is enclosed on both sides by diaphragms, and the whole slipped into a shell, edgewise. One figure herewith is a longitudinal section, and the other is a transverse section. The



750,835—TELEPHONE TRANSMITTER.

block G has a chamber I on each side of which lies a diaphragm N, carrying the electrode O. Secured at its central point above each diaphragm N is an outer diaphragm K, whose outer edges lie in a circular rabbet J in the block G, the idea being to cause the sound waves to impinge on the outer faces of the diaphragms K, only.

TIFF AT THE TELEPHONE.

"Who are you?"

"Who are you?"

"I asked you first."

"Well, I won't talk unless I know who you are."

"All right—neither will I; good-bye."—*Detroit Free Press.*

QUESTIONS AND ANSWERS

Conducted by J. C. Kelsey, Purdue University, Lafayette, Indiana.

We have a line, No. 12 iron wire, grounded, and for about two weeks we had sixty-six 1,600 ohm bells on the line, which was sixty-six miles long. About January 1 we divided the line, having finished the construction. We now have about thirty-one miles for one line and thirty-five for the other. Some of the bells ring weak, in fact hardly ring at all. What is the trouble with them?—C., Wyo.

With January weather, and in Wyoming, too, it would seem that a good reason for poor ringing would be the freezing of ground connections. From the question, the trouble seems to have been encountered since the sixty-six-mile line was cut in two. One might say that there was a partially short-circuited bell on the line, but to lay it to such a cause when the line is cut in two, would hardly be right. It is well known that grounds will freeze out and become absolutely dry. I should think that deep ground rods would be necessary for best operation of grounded lines in your country.

We have a magneto system with 80 ohm ringers, and it is necessary to connect two telephones on the same line, in the case of doctor's residence and office on different leads. Is there any way by which I can cut in additional resistance in our present 80 ohm coils, so as to bridge these two lines together on our cross connection board at the exchange? Of course, we could get 1,000 ohm ringer spools, but it seems to me there should be some way of making or a place to buy shunt coils for such use as I speak of. Give me full particulars, and if you know of any firm manufacturing these shunt coils give me the address.—G. W. C.

I am not aware of the use of a shunt coil made for this purpose. If the two telephones were in the same house, or in the same lead, it would be a simple matter to put the two telephones in series. In the case where the different leads contain lines to work together, they could be placed in series, too. It would take two exchange jacks, with the single 80-ohm line drop in series between the two contacts of the jacks. When the doctor rang on his line, he would throw down his exchange drop and ring the bell of his residence. The operator would plug in and separate the lines. I am informed that this method works fairly well. Of course, it would open the line signal so that the other party could not call central as long as the first party was plugged up. They could be called, however. Another method would be to put a plain non-inductive resistance in the 80-ohm bell circuit, something like 500 ohms. Then you could bridge the lines together just the same as a bridged line. When the parties talked, the resistance would be cut out with the bell. The idle instrument, with the 500 ohms put in series with the 80-ohm bell would form a good resistance path against voice currents and would give a bridged effect. The iron in the core of the 80-ohm ringer has enough reactance. If the resistance is high enough, the impedance will be satisfactory. The insertion of the plain resistance will not weaken the ringing as would an inductive resistance. A small coil of German silver wire, or a piece of carbon will make a good non-inductive resistance. This method will give satisfaction also. But the day of the series instrument is past. In the future, put in bridging bells. They are so much more useful for many purposes.

Explain why a five bar generator turns hard when short-circuited.—B., Wis.

This is not an action peculiar to a five-bar generator any more than to any other. The ordinary five-bar generator should have a slight pull on open circuit owing to the powerful magnets and it takes some energy to pull the armature poles away from their normal position. When the generator is short-circuited, the maximum current is generated in the armature, thus giving the poles their greatest strength. Suppose the north pole of the field magnets, a very powerful magnet, to come into close contact with the south pole of the armature. They attract one another. Likewise the north pole of the armature is attracted on the other side by the south pole of the field magnets. They are attracted so strongly that when the armature is turned the separation causes a great effort at the generator handle. It is exactly the same effect if you would try to pull a piece of iron away from a strong electro magnet. It so happens that a short circuiting of the generator makes the armature poles powerful electro magnets. They naturally cling to the nearest piece of iron, or steel, and if that piece is of itself a powerful magnet of opposite polarity you will get the hardest pull possible.

When I connect an 80 ohm ringer in series with a 1,600 ringer, the 1,600 ohm bells ring loud, while the 80 ohm bell does not make a movement.—Wis.

The 1600-ohm ringer gets 1,600 ÷ 1,680 of the electromotive force of the generator, which gives sufficient energy to actuate the bell. The 80-ohm bell, not very sensitive any way, only gets 80 ÷ 1,680 of the electro-motive force of the generator, which does not give it enough current to even slightly agitate it. If the generator has a voltage of 100, then the 80-ohm bell will get less than one-twentieth of 100 volts, which is five volts. You can imagine that a five-volt generator would not have a very strong effect upon an 80-ohm bell.

In using a Pignolet triple reading volt-ammeter to ascertain the resistance of lines, I find that when testing from the distributing board to the switchboard and back that the reading is .5 of a volt, when the battery electromotive force was 5.8, and the resistance of the volt meter was 150 ohms. This gave me approximately the resistance of the line and drop, being a little more than 1,600 ohms. But in testing from the distributing board out over the line the reading was as high as 2.6 in some lines and down to 1.7 in others. It ought to be lower than .5. What is the trouble?—B. G. R.

From the formula of resistance by the voltmeter method, the (Battery voltage × resistance of voltmeter — resistance of voltmeter) ÷ reading of voltmeter = resistance to be found.

Then $\frac{5.8 \times 150 - 160}{.5} = 1{,}590$ ohms. This is drop circuit resistance. In measuring the outside lines, you get a reading of 1.7. Let us see what resistance that gives.

Then $\frac{5.8 \times 150}{1.7 - 150} = 362$ ohms. Apparently you are assuming that you have but one bridging station. You say you have twenty-five of them. I cannot see why you should get a reading of .5 for the external circuit. Two 1,600-ohm bells in parallel would bring down the combined resistance to 800 ohms. Then a third party in parallel would bring it lower still, and finally you would reach a point where an additional bell would not make any change

in the line resistance on account of the line resistance. It is a fact that after eight parties are on a line, you are not able to tell from a measurement whether there is a short-circuit on the line, or a circuit open. I would say that the reading 1.7 or 362 ohms is not wrong. Now look at the reading of 2.6, and let us see what resistance that represents.

$\frac{5.8 \times 150}{2.6} - 150 = 190$ ohms. That would show a well-loaded line.

From the rest of your question, "Out of ten lines tested, the majority tested 1.7, while to switchboard, they tested .5. Our cable has no visible ground, yet when I tested it, using the ground as a common return, it showed 1.7, a reading similar to the lines. It is obvious that the current when testing, leaked out somewhere. But our lines show no cross when ringing, and we use a higher voltage than the testing set registers," it shows that when testing the cable alone, you did not cut off the lines. Your whole trouble comes in from misunderstanding of the laws of parallel circuits. Your exchange end represents a line with one party, but your outside lines have many parties and cannot be measured the same as one line subscriber would. The more parties on the line, the lower the resistance of the circuit as a whole. I would suggest that you measure a line with one subscriber, say, right in your exchange. Then put another party on the line, and get a measurement of the line as a whole. Then three, four, five, on up to a number only limited by the office equipment. After measuring this way with all instruments in one office, as it were, then measure up an artificial party line arranged that when you add a second party and so on up, you will also insert the amount of line resistance in each case. You will find that point where the addition, or subtraction, of a party will not affect the instrument reading. Instrument readings on heavy party lines have no value at all.

Last January's TELEPHONY contained an article from "E. O. C. Co." mentioning a case of trouble or disturbance in its telephone system. The description of the system is rather vague, consequently the cause of the disturbance is hard to explain. I will venture to say, however, that the trouble is in the lighting plant, one of the lighting plants being grounded would cause it. The common return may be faulty, which would account for the sparks from the stove. If one of the telephone lines were grounded the disturbance would affect that line alone. I believe the company would do well to look to its electric light circuits for this trouble.—G. E. R.

Doubtless the readers remember the phenomena connected with the E. O. C. Co. exchange. I was hopeful that they would see fit to answer the questions propounded to them in February. If they were answered, it would be a great help toward the solution of the problem. The E. O. C. Co. has probably found the trouble by this time, and I am sure that the readers would be glad to hear from it.

Please inform me to the best of your knowledge, or even if you have to ask parties of authority, whether an automatically acting, recording and repeating telephone would be of any commercial importance, or whether it can be sold after made. I have read, several years ago, of an offer of $1,000,000 for such a machine. Do you know anything about it or would such a figure be enough for such a machine? If you have anything in the way of information on this subject, I shall be obliged to you, for I have such a machine half done.—Ala.

One million dollars for your machine would be a very small figure. The offer for that machine for repeating has been withdrawn, because the authorities of the company became frightened at the great number of successful repeaters sent to them for trial and they could not afford to buy them all. As you have your machine half done, you should be careful to watch it closely, or you will get the other half done before you know it. Cases have been known where the sudden accession of a million dollars has robbed people of their reason and then they couldn't spend the money intelligently. The engineers of the Michigan Telephone Company at Detroit, did the experimenting and testing of the repeaters, and I am sure that a letter addressed to its engineering department would procure for you a world of information. By all means keep on with the good work.

Kindly inform me what you think of the selector, or lockout system, and what make would you recommend? Do you know much about the Norstrom lockout telephone and the Nicholas selector? I should like to use some kind of a lockout for our lines.—H. N. Ia.

Am not familiar with the Norstrom system except from the description given in the patent digest. I saw a very effectual demonstration of the Nicholas system at the Interstate telephone convention. It is a simple device and should be easily handled. The Norstrom Lock-out Telephone Mfg. Co.'s advertisement is in this number. The Nicholas Selective Company may be reached by addressing it at Rochester, N. Y.

I understand that in the new Douglas exchange of the Chicago Telephone Company a special tone test is provided upon the party line circuits, to be used when one subscriber calls another on the same line. Upon testing such a line, the operator immediately receives a busy test, different in tone from the ordinary test. This signal is given the operator automatically by the action of a special relay, and upon hearing it she tells the calling subscriber to hang up until she calls the party desired. When the call has been made the subscriber may take down his receiver and proceed with the conversation, after the necessary nickel has been deposited. Now, after the party has found out that the subscriber called for is on the same party line, does the operator withdraw the answering plug and then insert the calling plug before ringing up the subscriber? It would seem that otherwise the current from the ringing generator would pass through the calling multiple to the answering jack and then through the battery. The result desired could doubtless be accomplished by not inserting the calling plug at all in the jack, but by ringing through the answering jack by a ring back key. How does the waiting subscriber know when the called subscriber on the same line has taken down his receiver? Doubtless the waiting party is instructed to take down his receiver as soon as the bell stops ringing, but in case of selective ringing, the receiver must be taken down when the waiting subscriber considers that sufficient time has elapsed for the called party to be rung up. Perhaps it is not necessary on this selective system for the party to hang up at all.—H. S. W., Pa.

I have no means of inquiring into the telephone company's methods, but from the description the method is one designed by Joseph O'Connell to prevent a very common operating trouble—that of the operator testing the multiple sleeve of the very jack that she has just plugged in and then telling the waiting subscriber that the line is busy. But, of course, a subscriber would know better from the fact that he has just called central. If it was busy, he certainly could not. When the tone test reveals to the operator that she is testing the line that her answering plug is inserted in, she inserts the calling plug as in any connection, but withdraws the answering plug, because it would interfere seriously with the ringing. It is not possible that ring back keys are installed, especially if party line keys. It would make a very cumbersome keyboard with both answering and calling cords provided with party ringing keys. The waiting subscriber is told to hang up and he uses his own judgment as to listening in. He certainly comes in too soon most of the time, thereby deceiving the operator and causing delay in operation. There is no selective ringing that will permit the waiting subscriber to stand with his telephone to his ear. He must hang up, or all the bells will ring. This circuit is only applied to one operator's position, when possible, and all the party lines are placed in front of one answering operator. If the reader will refer to page 200 of September TELEPHONY, he will find the sketch of the O'Connell test and an excellent description by Mr. Clement. If the Auditorium had ten trunk lines scattered through the board, and an operator testing a trunk found it busy, the tone test scheme should be applied to it. The tone test would indicate that there were other lines to that exchange and she would look them up.

$50,000,000 Suit Against the Bell

OSSIAN CAMERON

OSSIAN CAMERON.

The suit of Atlantic & Western Telephone Company vs. American Bell Telephone Company, et al., was instituted in the United States Circuit Court for the Northern District of Illinois, February 8, 1901. The suit is based on patents on the telephone issued to Henry C. Strong. Mr. Strong made his first application for a telephone patent, May 22, 1877, but the first patent issued to him was No. 235,658, December 21, 1880. This patent covers the telephone receiver as now in commercial use.

In the specification in patent 235,658, Mr. Strong states: "My invention consists first of a metal tube in which is inserted through a socket or opening in the lower portion, a beveled bar-magnet, to which is attached a spool of insulated wire the same as used in telegraph instruments. The magnet and spool thus combined adjust or turn in the tube below, but not touching the diaphragm of non-conducting substance to which is attached a soft iron disk just above the bar-magnet, as large as the end of the magnet beneath it. Above this non-conducting diaphragm, I place a secondary diaphragm with a perforation in the center thereof and just above the soft iron disk attached to the non-conducting diaphragm. By this combination of diaphragms a peculiar augmented effect is produced in the receiving telephone neutralizing induction and magnifying the tones of the human voice when received from the speaker at the remote end of the circuit, in no wise diminished by the length of the circuit or the high tension of the electric current of the telephonic closed circuit.

"My invention consists second of a spool or coil of insulated wire attached to the lower or opposite end or pole of the magnet and fastened by a nut on the end of the magnet or thread, which engages with the thread cut on the end of the magnet holding both spools on the bevel bar-magnet firmly in their place, the beveled form of the magnet producing an increased magnetism within the iron tube for the reason that there is a larger amount of metal at the end next the diaphragm, and consequently greater attraction and repulsion than there would be were the magnet of the same size throughout its length. Thus securely attached, the additional coil at the lower end of the magnet serves as a relay when connected by wires as I attach them to plates of metal of opposite polarity, placed in the earth or in water on the earth as most convenient. The electric earth currents derived in this manner are attracted toward and flow from the magnet coils of the telephones intensify the polarity of the magnet, making communication distinct and reliable on long circuits and lessening the induction."

See Figure 1.

During the taking of testimony in Boston on behalf of the defendants in this case, this patent was shown to Chas. P. Cross, expert for the said defendants, and he was asked if the instrument therein described was not substantially the same as the receiver in complainant's exhibit, said exhibit being telephone as in current commercial use, and Mr. Cross made answer as follows: "As far as I observe from a somewhat hasty examination of the specification and drawings, the instrument of the patent referred to embodies the substantial parts of the telephone of defendants' apparatus."

HENRY C. STRONG.

The main patent in the suit, however, is No. 312,670, issued February 24, 1885, and substantially based on the application of 1877. This is a combination patent on the telephone and signalling device. In the specification Mr. Strong states: "It is the object of my invention to render it possible to receive and transmit communication by electricity over lines of great length without the use of repeaters at intervening stations when the line shall be broken and the ends of the broken section or sections grounded and without the employment of a return circuit other than that afforded by the earth.

"The mechanism I employ to produce the aforementioned object comprises an ordinary telegraphic signal-instrument connected with the line-wire having one-half of its armature removed and the other half operated in the usual way by the portion of the electro-magnet over which it lies, and having the remaining portion of the electro magnet provided with a permanent magnet affixed to its core and with a cup and diaphragm to constitute it a telephone."

And in the claims Mr. Strong states what he desires to secure by letters patent is "(1) A telegraphic signal-instrument having one pole of its electro-magnet connected up in a battery-circuit and provided with an armature to constitute a signal-receiver and having the other pole provided with a permanent magnet adjusted to its core, and with a diaphragm and cup to constitute a telephone receiver and transmitter substantially as described. (2) A combined telegraph-instrument and telephone comprising the electro-magnet AA', armature t, diaphragm s, permanent magnet q, adjustable within the core r, so as to lie firmly against the under side of the diaphragm s and cup B, the whole being constructed and arranged to operate substantially as and for the purposes set forth." See Figures 2, 3 and 4.

In this suit some five or six eminent experts testified that the device specified in this patent contains substantially all the parts found in the telephone and signalling device connected therewith as commercially used by the defendants.

As a defense to this suit, the defendants set up the Bell patents, No. 174,465, of March 7, 1876, and No. 186,787, of January 30, 1877; T. A. Watson's patents, one on a telephone call signal apparatus, No. 202,495, of April 16, 1878, and one on a polarized armature for electric bells, No. 210,886, of December 17, 1878; and the discredited Dolbear patent, No. 220,205, dated September 30, 1879; also the combined telephone and electro-magnet, Dolbear patent, No. 226,906, dated April 27, 1880.

In the specifications of the Bell patent, No. 174,465, of March 7, 1876, Mr. Bell states: "In illustration of the method of creating electrical undulations, I shall show and describe one form of apparatus for producing the effect. I prefer to employ for this purpose an electro-magnet A^5,

having a coil upon only one of its 'egs b. A steel spring armature c firmly clamped by one extremity to the uncovered leg d of the magnet, and its free end is allowed to project above the pole of the covered leg. The armature c can be set in vibration in a variety of ways, one of which

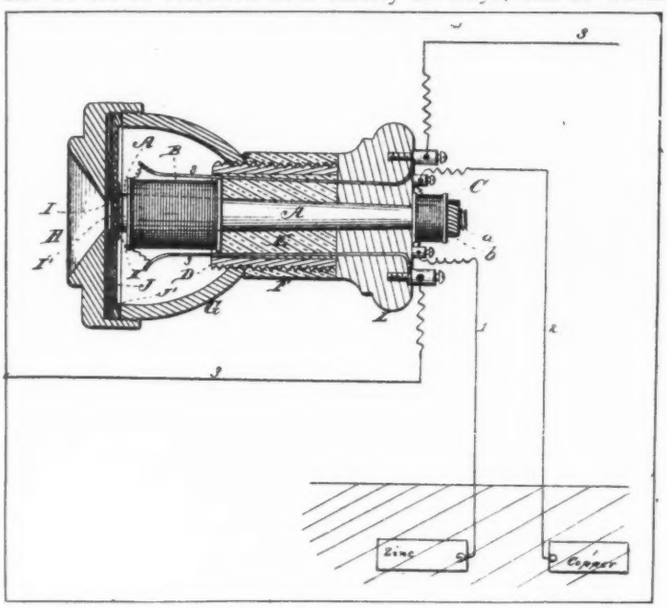


FIG. 1.

is by wind, and, in vibrating, it produces a musical note of a certain definite pitch."

The Bell expert was asked, in the taking of testimony in Boston:

Q.—What would you say in reference to the necessity of using a permanent magnet in the receiver?

A.—It is customary; it is not necessary, by any means.

Q.—Is it not a fact that in receivers as in general commercial use, that such is the case?

A.—Certainly. I have just said it is customary.

Q.—*I will ask you to state whether or not in your opinion an electro-magnet could be successfully used in the position which you have just testified that the permanent magnet is customarily used?*

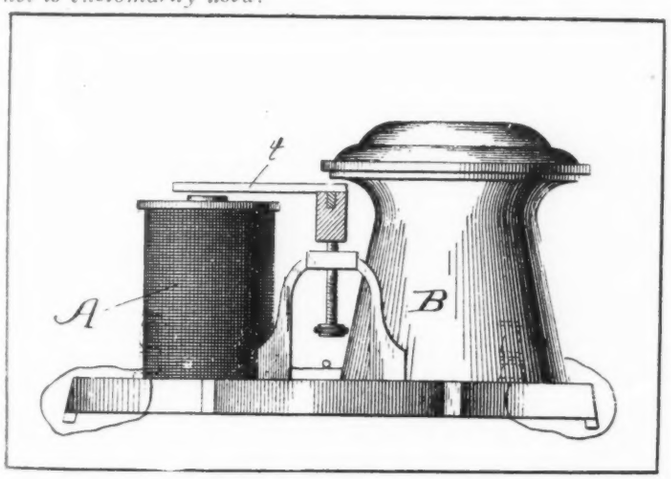


FIG. 2.

A.—I have no doubt it could be, but that would be a clumsy arrangement.

Q.—Have you ever known it to be so used commercially?

A.—I don't recollect any such case."

Notwithstanding Bell's claims and the decision of the Supreme Court in the telephone cases (126 United States Reports), it is now generally accepted that Bell was not the inventor of the telephone. It is understood that he was in a position through which he could acquire certain information and that he kept reaching after patents and that the patents he did obtain according to their specifications did not in any way cover the speaking telephone as now in commercial use. For a full and exhaustive discussion of this subject, the reader is referred to the article written by

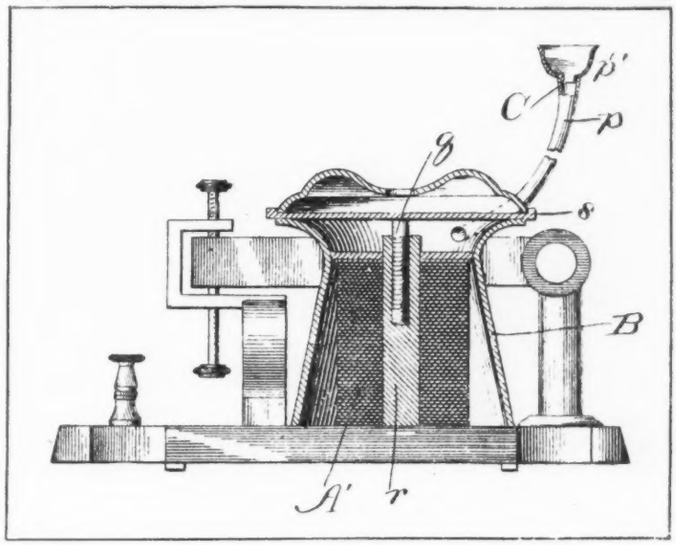


FIG. 3.

Oscar Wentworth Rogers on the "History of False Claims of the Bell Company," published in the November number, 1903, of TELEPHONY, and in passing, I quote from that article as follows: "It must be borne in mind that the Bell monopoly was solely claimed upon the devices and methods of 1876 patent from 1878 to 1893. Why not upon 1877 patent—the devices of which really worked? Because it was not a specific device or apparatus patent. In 1879 the business seemed to be springing from the earth and showering from the clouds, and the Western Union had settled with the Bell company. Then the Bell gang looked around, peering everywhere for something upon which a monopoly

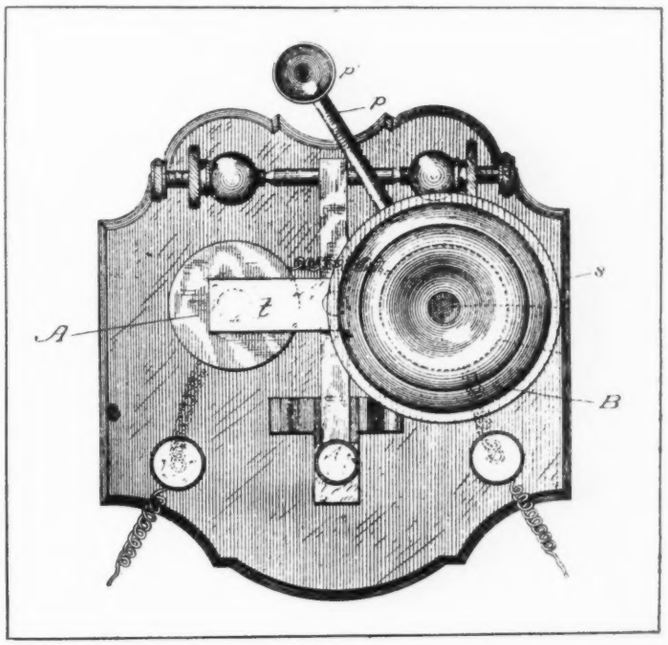


FIG. 4.

claim for use of electricity in speech transmission could be had. Only Bell's 1876 patent was sufficiently obscure in its forms and definite in its promise to answer the needs. Edison and Berliner claims were fought, other obstructions

removed and the campaign planned to capture the Supreme Court."

It is sufficient to state for the purposes of this case, that in any event the Bell patents would not be a defense for the reason that the patent in suit is a combination patent and specifies a device which is not described in either of the Bell patents. The Dolbear patent having been attacked and descredited by the Bell people, I submit that in equity they are estopped at this time to set it up as a defense in this suit. For the same reason that the Berliner patent was held invalid, we claim that the Watson patents, if of any force, which we do not admit, will also be held to be invalid, and therefore not entitled to any consideration as a defense in this suit.

There is abundant testimony in the record in this case to show that Mr. Henry C. Strong was familiar with the art of telephony and the principle of transmitting articulate speech by electricity and that he had made experiments along that line as far back as 1861. However, in his application for patents, Mr. Strong recognized and referred to the work of some of those who had preceded him. He gave credit to Lancelot H. Everett, who obtained a patent in 1868, and always recognized the excellent work which had been accomplished by Chas. Bourseul, Mr. Philip Reis and others.

We were fortunate in obtaining the evidence of people who knew Mr. Strong and who knew of his experiments and his claims as far back as 1857 and 1858 and from that time on down till he made his application for his first patent. In his case "Truth seemed to arise from the earth and righteousness looked down from heaven." As an illustration, since the evidence has been filed, letters have been received by his counsel from old acquaintances, a sample of which is the following:

TALAPOOSA, GA., Feb. 6, 1904.

Ossian Cameron, Esq.,

My Dear Sir—In the matter of Henry Strong's claim to the invention of the telephone, I remember when a boy I worked in the same printing office with him in Macomb, Ill., and he often talked about how he could talk over a wire. That was just before the civil war. Of course I cannot remember any dates, but I remember the talk and we used to call him "cranky." Some fifteen or more years ago I was talking to J. C. Niles of Brookfield, Mo., who had known both of us in Illinois, and he told me that in 1857 he was keeping store in Sheffield, Ill., and that Henry Strong came to him and wanted him to furnish money to patent a device for talking any distance over a wire, and he thought Henry was "off in his head." * * * I thought Henry Strong was dead long ago, but it seems he is not.

I don't know whether Henry got his patent quick enough or not, but I do know that he talked about a telephone as far back as 1860.

When you see Henry Strong, remember me to him.

Yours truly, JOHN D. ABELL.

Some twenty years ago, a suit was filed in the Circuit Court of the United States, in the District of Massachusetts, by the United States against the American Bell Telephone Company and Alexander Graham Bell, for the purpose of cancelling and vacating the Bell patents on the ground of fraud. This case has never been finally disposed of and is still pending in that court.

In the case at bar there are several complicated questions of law, but thus far they have been successfully met and the outlook is that substantial, though long deferred, justice shall be done to the complainant in this case and to the aged inventor.

AUTOMATIC TELEPHONE CHANGES.

Recently the Illinois Telephone & Telegraph Company filed for record with the county recorder a bill of sale for all its property, including tunnels, tracks, telephone cables and automatic switchboard appliances and telephone system.

The bill of sale runs to the Illinois Tunnel Company, an Illinois corporation, recently chartered, with an authorized capital of $30,000,000 and the power to issue as much more in bonds.

Accompanying the bill of sale there was also filed for record a trust deed for $30,000,000 on the assets of the new corporation to secure a bond issue. The previous mortgage on the conduits and other property of the Illinois Telephone & Telegraph Company was cancelled, indicating that the old bonds have been taken up and new bonds put in their place.

This represents one of the largest transactions relating to an intermural public utility matter that has taken place in years in Chicago.

The Equitable Trust Company is named as trustee.

MR. BENNETT'S NEW VENTURE.

I. A. Bennett, general sales manager for the Electric Appliance Company, Chicago, has resigned his position, to take effect March 1, and will open the Chicago offices of the Phelps Company, of Detroit, Michigan, manufacturer of the Hylo turn-down lamps and other specialties. Mr. Bennett resigned a position that he held with the Electric Appliance

I. A. BENNETT.

Company for a considerable length of time, having served with this company for about eleven years, he previously being connected with the Ansonia Electric Company.

Mr. Bennett's energetic push as a sales manager and originality as an advertising man has made him one of the best known men in the electrical business, and he is receiving congratulations on all sides, on his entrance into a field which promises very handsome returns. He has also accepted the presidency of the Central Station Publishing Company, which is being formed for the promotion of Central Station advertising.

Mr. Bennett's new offices will be located at 529-530 Monadnock Block, Chicago. He will carry a full and complete stock of every style, base and voltage, Hylo lamps, and specialties, making shipments from Chicago stock.

The Lorimer Machine Telephone

F. DAGGER

Of the various branches of telephony, there is none of so great importance as that which has to do with the handling of the subscribers' calls—the operating department. Yet there is no department in which there has been so little progress in regard to originality of design, and the adoption of new methods. It is true that central energy and common battery systems are recent developments, but so far as the methods of connecting subscribers is concerned, we still have the plugs, cords, listening and ringing keys, multiple jacks, and indicators or visual signals, which were in use two decades ago. It must be admitted that many improvements have been made in the design of these appliances, but in regard to the apparatus handled by the operators, and the means by which the subscribers' connections are made, there has been no departure from old principles. It may be that with manual operating, it is not possible to devise simpler and better means of enabling an operator to handle the traffic. It appears that the efforts of inventors to improve the methods of telephone operating have been in the direction of reducing the size of the various parts, and crowding them into the smallest possible space, in order that the operator may attend to a larger number of lines, and what is more important in large exchanges, have access to the connecting points of all the subscribers on the system.

The result of all this has been that while many ingenious improvements have been made in the working parts, which reflect great credit on the designers, the equipment as a whole has become more complicated, necessitating a more highly paid maintenance staff, while the cost of construction in the central office has increased and continues to increase with the growth of subscribers to such an extent that a central equipment of 10,000 subscribers completely wired and ready for service costs four times as much per line as does one for half that number. The increased cost, however, does not stop here, for the strain on the operators is such that a girl can only work for a short period at a time, and relays have to be provided, which entail a greatly increased pay roll.

For instance, the New York Telephone Company, with 70,000 subscribers, has, in New York city, one employe for every seventeen stations, with a pay roll of $40,000 per week, exclusive of officers' salaries. These figures are the highest on record, but they furnish an indication of the cost of operating a large exchange on the manual system; a cost moreover which telephone subscribers, by their rentals, have to provide for. This naturally raises the question as to what is going to happen when the exchanges of the Independent telephone companies reach a limit, which will necessitate the replacing of their central equipments with others of increased capacity. The answer is simple; either the rates must be increased to meet the additional cost of construction, or all extensions must cease, if the present type of central equipment, with manual operators, is adhered to. Already our Bell friends have exultantly held up for the admonition of the public, several instances where the rates have been increased to subscribers of Independent exchanges. This, however unavoidable under the present conditions, is much to be regretted, and it points to the great need there is of some system which will enable extensions to be made without necessitating increased charges to subscribers. If the Independent companies can achieve this end, the Bell exchanges will be "snowed under," and the financial success of the Independents will be assured for all time.

It is an assured fact that with the existing manually operated exchanges, no economies can be effected which will secure this desired result, and it is no doubt because of this that considerable advances have been made recently in automatic or machine operated exchanges. Like every other invention having for its object the displacement of manual labor by machinery, the automatic telephone operator has had many enemies, and in addition to this fact, telephone managers and engineers have been educated by the manufacturers of manual switchboards to believe that the hello girl was indispensable, and that no machine could be produced which would satisfactorily perform the same functions.

It has been stated by men who are looked upon as authorities in the telephone art that automatic exchanges were an impracticable dream, and these statements have to some extent been justified by the fact that several systems have been placed upon the market in an undeveloped state. Inventors have with undue haste placed their devices before the public in an incomplete condition, making all sorts of claims as to the unlimited capacity of their systems, only to find that they could not handle more than one hundred lines. There are several automatic systems, of more or less merit, capable of operating one hundred lines, which have been on the market for years, but these are entirely ineffective for handling the traffic of larger exchanges.

In dealing with this problem, it is essential that two principles be embodied in the system of the future, in order to ensure its permanent success. First: There must be an absence of individual switch mechanisms for each line, instead of which a percentage of connecting devices must be provided for each hundred subscribers, which will be common for the use of any subscriber, just as are the cords and plugs in the existing manual systems. Second: The system must be capable of being built up from one hundred lines to an exchange of any capacity, without increasing the cost per line beyond that of the first hundred installed.

These two points will be discussed at length later, but it may first be noted, in proof of what has already been accomplished, that automatic exchanges have recently been equipped on a large scale at Dayton, Ohio, and Grand Rapids, Michigan, with a system employing individual connecting mechanisms for each subscriber. These systems prove that for local service the hello girl can be dispensed with, but it is claimed by the manual switchboard manufacturers that the cost of construction, installation and maintenance, is such that in the aggregate, there is no advantage to be derived over the manual systems. It may be premature to accept this statement as true, but nevertheless the fact that each subscriber requires an individual selector containing 300 contracts, with a proportion of second selectors, and connectors amounting to fifty per cent of the total lines on the exchange, indicates that this system must be very costly to construct and maintain; while the space required for its installation is very great. Whatever the actual results will be in regard to these systems, time and experience alone can tell, and telephone managers will watch with great interest the operation of these exchanges. Enough has already been accomplished, however, to show that automatic telephony has come to stay, and it is perfectly safe to prophesy in view of hitherto unpublished developments that in the next few years the manual switchboard and the hello girl will be entirely displaced by the machine telephone operator.

An invention has entered the field, which is a revelation when compared with previous efforts that have been made in automatic telephony. In this connection it is gratifying

to note that while this system might have been placed on the market five years ago, its owners have with creditable modesty preferred to wait until they were in a position to

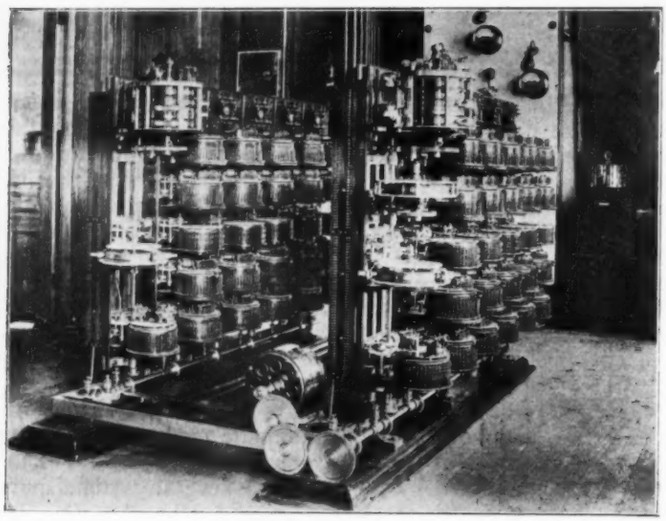
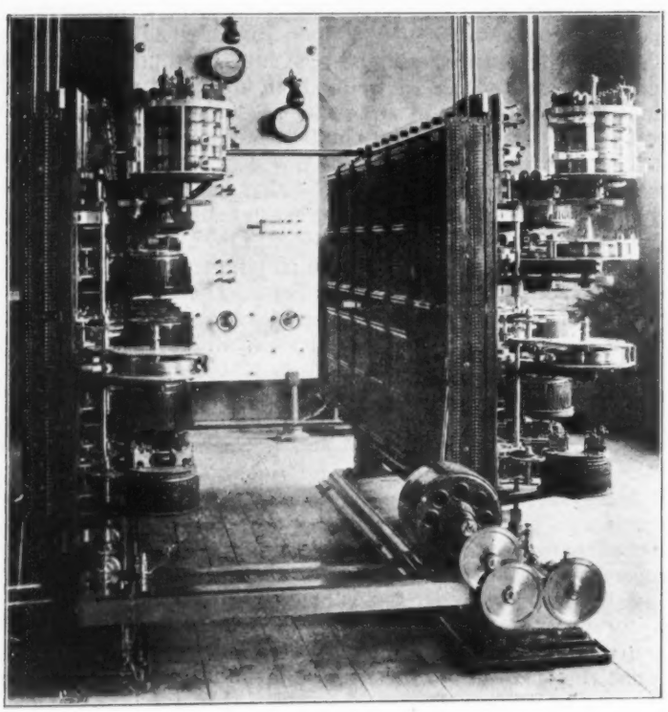


FIG. 1.

produce a perfect machine, capable of satisfying the most exacting demands of the largest exchange.

In 1896 a number of progressive capitalists formed a syndicate for the purpose of solving the question of machine telephony. At that time they had acquired the patent rights of an invention which promised great things, but after spending much money in assisting the inventor to complete a working exchange, it was found in actual operation to have many defects which would be fatal to its success. It was discarded just at the time J. H. and G. W. Lorimer, two brothers, who had given the subject much



ANOTHER VIEW OF FIG. 1.

careful study, came forward and undertook to produce a perfect machine. The plant was thereupon removed from New York to Piqua, Ohio, and the company which had been re-organized under the name of the American Machine Telephone Company, Limited, commenced experimental work on the new machine in a commodious factory adjoining the depot of the C., H. & D. railway; where for the past few years the operations of the company have been the subject of much curiosity on the part of an inquisitive public, who were not in the confidence of the company and could not understand why a factory should be running for years without showing any results in the shape of an output. All this time, with tenacious and commendable perseverance, experiments were being carried on, in the course of which several machines were built, only to be thrown on the scrap heap because they did not come up to the standard of perfection which the company had decided to be necessary in order to meet the requirements of telephone users. At last their efforts were rewarded by the production of the Lorimer machine telephone, a complete machine capable of performing all the functions of a telephone exchange, without the media-

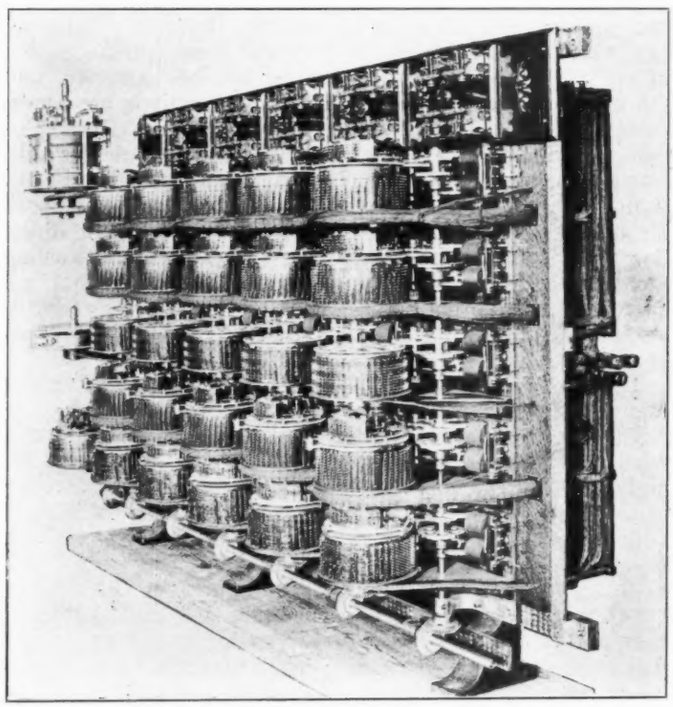


FIG. 2.

tion of a hello girl, with a rapidity and regularity impossible of achievement with manual labor.

The Lorimer machine telephone differs in every essential from all other automatic systems in the following points:

1. It is a machine—not an aggregation of individual step-by-step mechanisms, dependent upon electrically operated motor magnets or relays for their movement.

2. It is built upon the percentage system and comprises a percentage of connecting mechanisms, equal to the number of cords and plugs on a manual switchboard, and in like manner common to the use of every subscriber on its own section. It has no individual selectors, second selectors and connectors, hence ninety per cent of the apparatus necessary in other systems is eliminated.

3. It is built in sections of one hundred lines, each a complete working unit and which, when connected by means of a cable with any number of other sections, forms one exchange. An exchange can be started with a unit of 100 subscribers, and extended to any capacity in steps of 100 at a normal cost, per line, the last section costing no more than the first.

4. It is a central energy system, no talking batteries being required at the subscribers' stations.

Fig. 1 is an illustration of two sections of 100 lines each, of a 10,000 line exchange, completely wired and in operation. Each section comprises a sectional division and five per-

centage or connecting divisions, which will be described in detail later. The two sections are connected by a cable of trunk wires, which are common to the use of every subscriber on the system, and enable circuits to be formed between any two sections of a large exchange. At the foot of the first section will be seen the motor and driving gear, the latter comprising a series of horizontal and vertical shafts; one horizontal shaft on each section being geared to

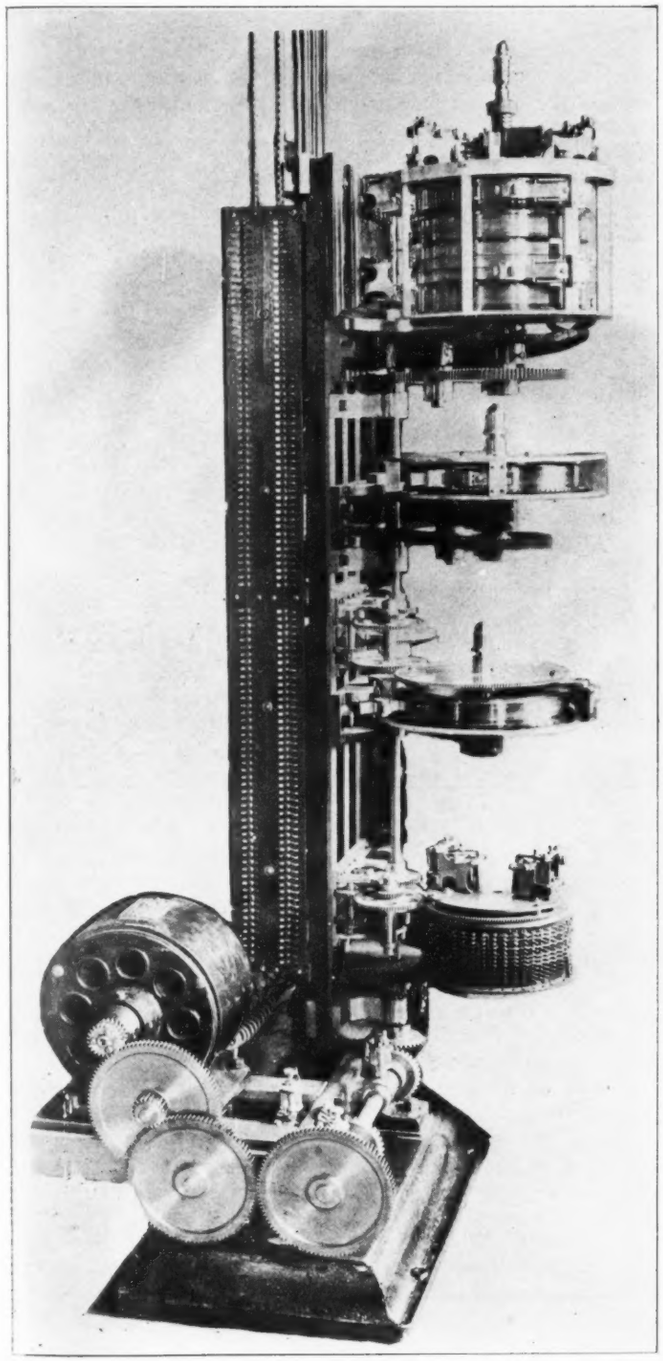


FIG. 2A.

a vertical shaft on each of the six divisions, a connecting shaft between the sections being geared to the sectional shafting and the motor. The power required to drive the shafting is ⅛ h. p. per section, and the shafts are revolving continuously in a working exchange at a speed of fifty revolutions per minute. By means of the revolving shafting in combination with electrically controlled clutches at the sending in of a call, the circular switches of an idle division are stepped to their required positions, and released when a conversation is finished. A battery of thirty volts charged from a motor-generator plant, supplies current for the central equipment and for the subscribers' stations.

Fig. 2 shows a front view of one section complete and ready for shipment. The frame of each section is built entirely of steel and carrying projecting arms of the same material upon which the cylinder switches that form the divisions are fitted. No wood enters into the construction of the exchange, thereby rendering it fireproof. Each section occupies a floor space of 1½x10 feet and is 4 feet in height. In large exchanges the sections can be arranged in tiers of two and placed front to back, allowing sufficient room for circuit changing device comprising four commutator rings and two continuous battery rings. Three of these rings contain 100 segments each; one, the line ring, being connected with the No. 1 line of each of the subscribers' stations; the

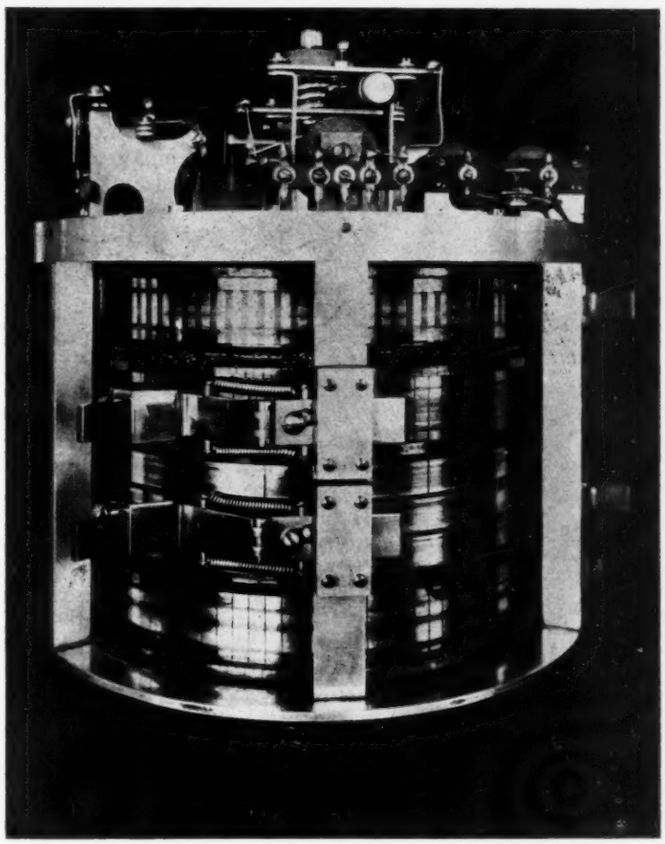


FIG. 3.

second, or guard ring, is connected with the 100 guard or busy test lines of each percentage division, by means of which a busy line is guarded from interference. The third, or units ring, in combination with the fourth, or tens ring a passage way. The weight of a section is approximately 1,000 pounds.

The first row of circular switches, shown in Fig. 2 A, are arranged vertically on the section and comprise the sectional, or controlling division, the function of which is to receive the preliminary calling impulse from the subscriber's station; to select an idle percentage division, and to arrange the circuits to enable the percentage division to complete the connection. The sectional division consists of a decimal indicator, a decimal register controller and a division starter.

Fig. 3 shows the decimal indicator which consists of a having ten segments, in conjunction with the decimal register controller (shown under the demical indicator) indicate the units and tens value of the calling line. Thus is No. 76 calling, the revolving concentric ring (to be referred

to) would stop with the contact brush resting on the seventh segment of the tens ring, and that of the units ring on the sixth segment. The positions of these brushes determine the action of the primary connector of the division selected for the call.

Around the commutator a concentric ring carrying contact brushes is constantly revolving at the rate of twenty revolutions per minute, a brush passing over each segment once in every three seconds. In this short period, every line on the section has been tested for incoming calls. Upon receiving a call, it stops momentarily until a percentage division has been selected and the circuit completed therewith, when it continues its revolutions.

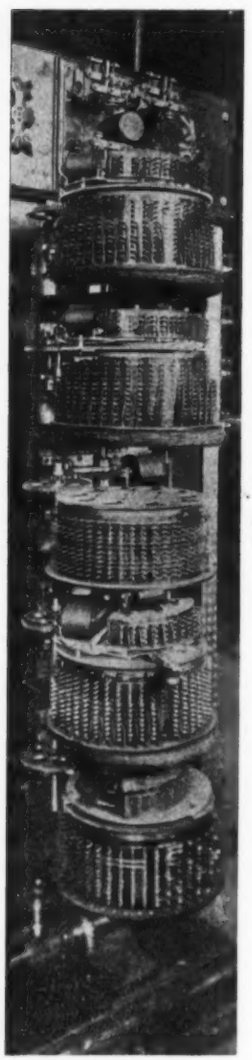


FIG. 4.

The decimal indicator does not, like the hello girl, wait until the connection is completed before attending to the next call. It can, therefore, get through with three or four times as much work in the same length of time. It does not waste time in talking. It never tires or gets slow. It cannot err. It is always on duty. It cannot become confused by a rush of calls. It surpasses human fingers in deftness and almost outthinks the human brain.

The division starter of the sectional division is employed in combination with the decimal indicator to select an idle percentage division, and is arranged to be operative only on one of the latter which is idle.

Fig. 4 shows a percentage division, which consists of a vertical row of five cylinder switches comprising a primary connector, a rotary switch, a signal transmitter controller, an interconnector, and a secondary connector. It also has four semi-circular switches known as a decimal register and three signal registers, if the exchange has a capacity of over one thousand lines. Besides these, there are three relays termed signal relay, release relay, and ringing relay. The primary connector contains contacts representing the lines of all the subscribers on the section, and by means of rotary contact brushes in combination with the decimal register on top of the cylinder switch, open up a path for the signals from the subscriber's station, and also for the talking circuit when the connection is completed. In other words, the primary connector forms the connection between the exchange and the calling subscriber when a call is made. The rotary switch is a circuit controlling device which forms the circuits for the control of the rest of the division, and in combination with the division starter holds the division free from interference when in use. The signal transmitter controller, by means of the rotary contact brushes, performs the functions of an impulse generator and supplies the means for energizing the controlling magnet of the subscriber's signal transmitter, and the operating magnets of the signal registers. When the connection is made, it also forms a part of the talking and ringing circuit. The interconnector is the trunking device for completing the connections between the sections, carrying contacts upon which are represented trunk circuits connected with secondary connectors on every section secondary connector of the distant section to which the called subscriber's line belongs. The secondary connector carries contacts representing every subscriber's line on its own section and by means of rotary brush contacts, in combination with the interconnector, rotary switch and transmitter controller, completes the connection between the calling subscriber's line and that of the called subscriber on its own section. The signal registers are used for registering the numerical value of the different sets of impulses sent from the subscriber's station. The thousands register indicates the value of the thousands impulses; the hundreds register, of the exchange. By means of rotary contact brushes, it completes the connection between the calling subscriber's line on the primary connector of the home section and a

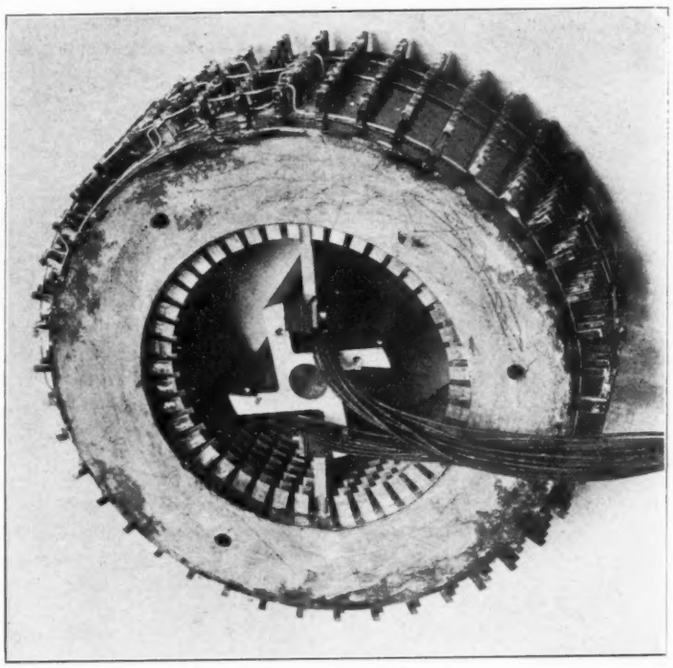


FIG. 5.

that of the hundreds impulses; the tens register, that of the tens impulses; the units value being indicated by the rotary brushes of the secondary connector. The signal relay controls the signals from the signal transmitter controller to the signal registers. The ringing relay conveys the ringing current over the called line. The release relay receives the release impulse caused by the replacing of the receiver on the switch-hook, and in combination with the rotary switch starts the mechanisms back to their normal positions.

It will be noticed that the cylinder switches comprising the percentage divisions, and also the division starter of the sectional division are alike in appearance, as they are in construction. They compose ninety per cent of the exchange mechanisms, therefore the solidity, simplicity and economy of their design is an important factor in the construction of the exchange. Fig. 5 is an enlarged view of one of these cylinders carrying the stationary contacts, and it may be remembered that they only differ from each other in a completed exchange by the manner in which they are wired to form the required circuits. Each cylinder is composed of a ring of insulating material 6¾ inches in diameter and 2½ inches thick, the space within which the contact brushes rotate being 4¼ inches in diameter. Embedded in the insulating material are twelve cylindrical rows, each containing forty-four strips of German silver, the outer ends of which form the tips on which the wires are soldered, and the inner ends the stationary knife contacts which are wiped by the double contacts carried by the rotary brushes. These cylinders, with the contacts embedded therein, are manufactured in one operation by a specially designed mold and

frame, at a cost below that of a single row of multiple jacks in a manual switchboard. When it is remembered that a 2,000 line multiple switchboard has 1,000 rows of Jacks; 2,000 subscribers drops, or lamps and 200 pairs of cards and

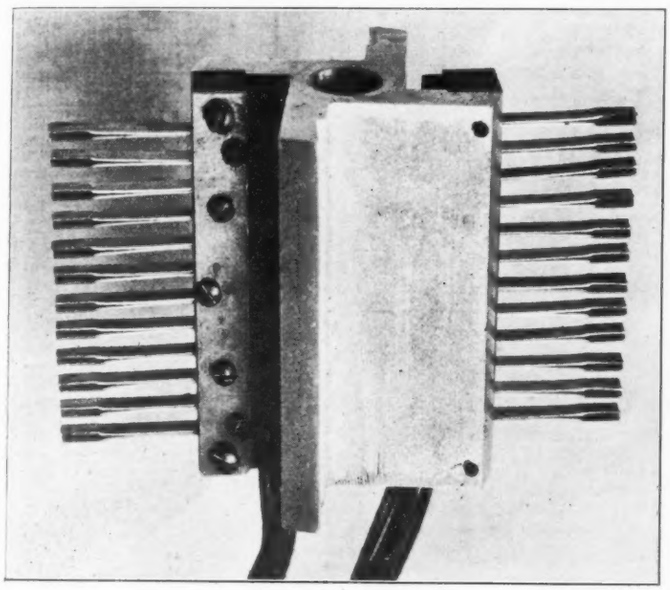


FIG. 6.

plugs; with cleaning out drops or lamps, and listening and ringing keys; in addition to the operator's equipments; whereas a Lorimer machine telephone of a similar capacity would require only 520 cylinder switches; some idea may be gained of the marvelous simplicity of this invention.

Fig. 6 shows the rotary brush for the cylinder switch. This consists of an aluminum spider carrying a number of brushes mounted radially in a clamp of insulating material.

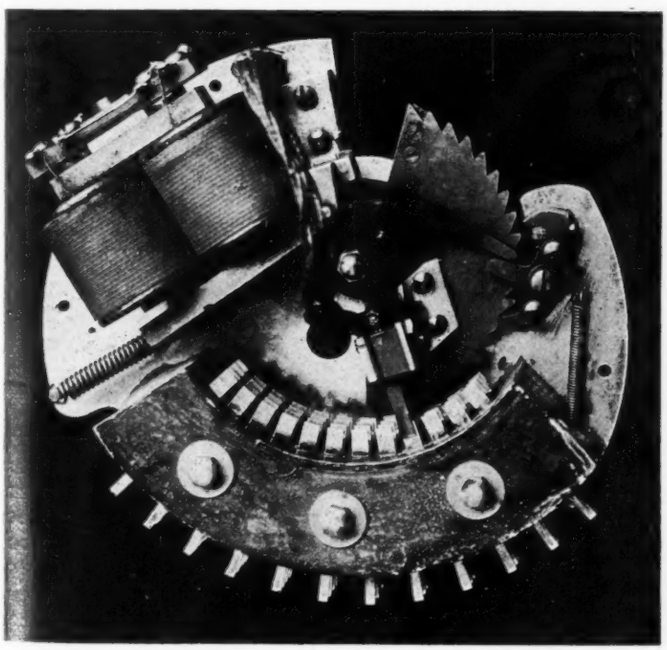


FIG. 7.

Each brush is composed of two German silver springs arranging to make hard wiping contracts on the two surfaces of the stationary contacts in the cylinder, when the spider is revolved. Through the center of the spider is fitted a spindle gear, which is operated by the constantly revolving vertical shafts of the divisions when a call is sent in in combination with a controlling electro-magnetic clutch. It may here be stated that with the exception of the concentric ring carrying the contact brushes for the decimal indicator and the shafting all the mechanisms are normally in a stationary position, motion to the other parts being only imparted by means of the electro-magnetic clutches, when a call is being sent through and then only one division of a section is affected.

The wearing qualities of the cylindrical switches is demonstrated by the fact that the one shown in the illustration has been tested by having the rotary brushes put through a series of rapid revolutions within the cylinder, corresponding to the completion of 23,000,000 calls, which would be equivalent to 150 years of actual use.

Fig. 7 is an illustration of a signal register, showing the fixed contacts and contact brushes, with the step-by-step apparatus and operating magnet.

Referring to the apparatus at the subscriber's station, Fig. 8, is a telephone set, which in addition to the usual transmitter, receiver and ringer, comprises a signal transmitter consisting of an indicator plate (see Fig. 9), with four vertical slots representing thousands, hundreds, tens and units, in each of which a pointer carrying a brush contact on the inner side of the plate is arranged to slide up or down opposite the numerals 0 to 9, of each slot. In this way any combination of numerals from 0 to 9,999 may be set, reading from left to right. On the inner side of the indicator plate are four sets of ten each, stationary contacts corresponding to the numerals on the face of the plate and so arranged that the contact brushes carried by the pointers make contact therewith. These contacts are insulated from each other and are wired to contact pins, four sets of ten each, which also correspond with the numerals on the indicator plate and are arranged with three extra pins called the preliminary, talking and normal pins, in a cylindrical row on an insulated plate. A revolving arm carrying a contact brush by means of a clock work device, is arranged in combination with a controlling electro-magnet, to be stepped forward over the contact pins. The contact pins, revolving arm and contact brush are shown beneath the talking transmitter in Fig. 8. A lever shown on the right of Fig. 8 sets the revolving brush at its starting point and also winds the operating spring of the clock train. The receiver switch-hook and contacts completes the set.

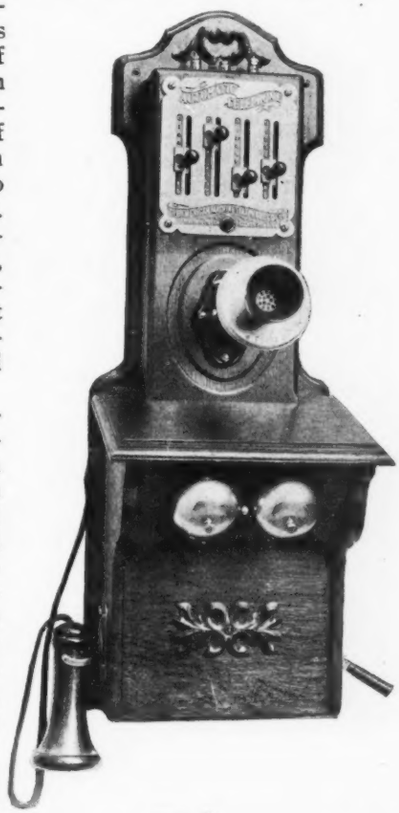


FIG. 8.

Line 1 is connected to the revolving contact arm. Line 2 to the receiver switch-hook through the receiver, transmitter, and ringer. The normal position of the lever is as shown in Fig. 8, with the revolving contact brush resting on the normal pin, the ringer and switch-hook to line 2, providing the receiver is in its place. It may here be stated that unless the contact brush is on the normal, or the talking, the switch-hook is locked and cannot be raised even though the receiver may be removed. Also, that unless the switch-hook is down, the lever cannot be moved or a call sent in.

When a subscriber sends in a call he sets the contact carrying pointers on the indicator plate to read from left to right. The number required shown in Fig. 9 is 5,276. The lever is then pulled down which moves the revolving

FIG. 9.

brush from the normal to the preliminary pin and connects line 1 through the preliminary pin, and the indicator plate with a common return wire. When the brush of the line ring of the decimal indicator reaches a segment representing line 1 of a circuit which at the subscriber's station has been connected with the common return wire, the pole of the storage battery are united through these wires and the windings of an electro-magnetic clutch through which the concentric brush carrying frame is revolved and the latter is stopped

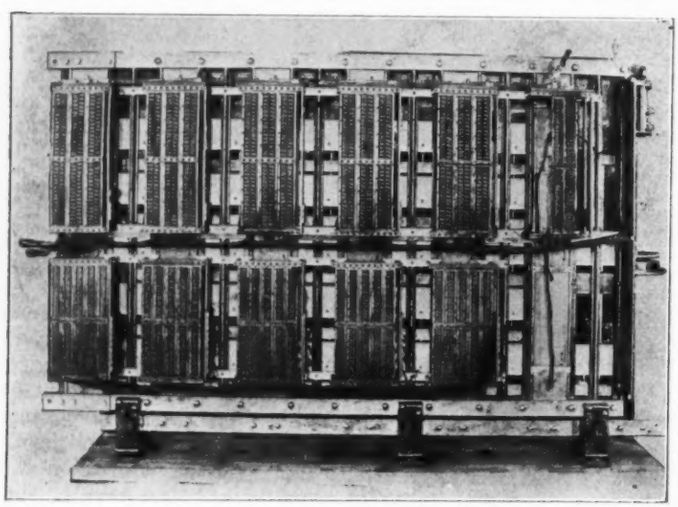


FIG. 10.

momentarily with the brush still resting on the segment referred to. In this position, in combination with the brushes resting on the segments of the units and tens rings, the division starter bridges a pair of contacts which forms a circuit to the rotary switch of an idle division, which in turn isolates its own division and forms a circuit to the primary connector. This steps forward its rotary brush to the unit of the calling number, by which is meant, if 1,635, it would rest on 5. At the same time the decimal register controller has made one revolution and sent three impulses to the decimal register on the primary connector, thereby stepping the contact brush to the contact representing 3, of the tens value of the calling number, and completing the circuit between the primary connector and line 35 of section 16 of the exchange. The rotary switch now steps to its second position forming a circuit for the signal transmitter controller, the rotary brushes of which in passing over the contacts closes the circuit from the battery, through No. 2 wire, the common return and the controlling electro-magnet at the subscriber's station, which being energized releases the lever and revolving contact brush and allows the latter to step-up over the contact pins. Immediately the contact brush steps off the preliminary pin on which it has been resting since the lever was pulled down, the circuit between line 1, and the common return is broken and the concentric ring of the decimal indicator at the exchange resumes its revolutions. The contact brush at the subscriber's station in passing over the pin in each set corresponding to the number on which the pointer is set, completes a circuit between the common return and line 1, and causes impulses corresponding to the numeral in each set to be sent to the exchange.

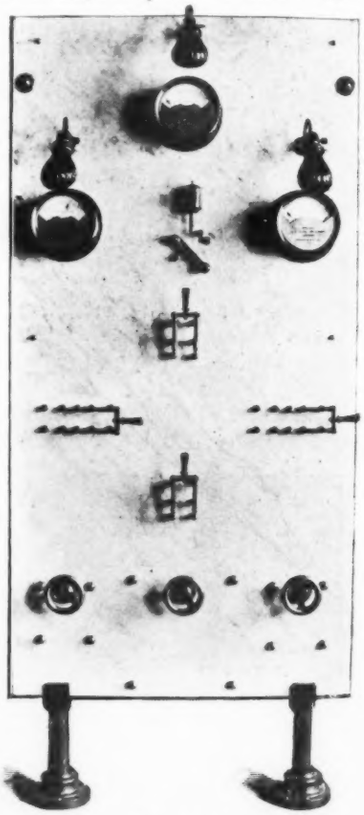


FIG. 11.

For example: If the pointers were set at 7,829, impulses would be sent; to the thousands register, seven impulses; to the hundreds register eight impulses; this would complete a circuit through the interconnector to a secondary connector on section 78 hundred. The revolving contact brush in passing over the tens set of pins would send two impulses through the interconnector to the decimal register of the secondary connector of section 78 hundred, stepping the rotary contact to contact 2 of the tens value of 7,829. The revolving contact arm in passing over the units set of pins, sends nine impulses to the secondary connector of section 78 hundred, which steps the rotary brush to the contacts representing line 29 of that section, thereby completing the connection with subscriber No. 7,829.

When the revolving contact arm reaches the talking pin, the rotary switch and signal transmitter controller have been moved to talking position, the receiver switch-hook is unlocked and the receiver is placed to the ear. The subscriber then presses the button, shown on the indicator plate, which forms a circuit with a ringing generator and the ringer of the called subscriber. If the calling subscriber hears the alternations of the ringing current as he presses his button he knows the connection is complete and that the bell at the other end is ringing; if on the other hand the line is perfectly quiet, he knows that the line is busy, in which case he hangs up his receiver. Hanging up the receiver under all conditions always restores everything to its normal position. The receiver must always be replaced at the close of a conversation.

Fig. 10 shows back view of a section completely wired. The neatness and compactness of the whole is apparent. The wiring of each section is completed at the factory

where advantage can be taken of specially designed labor saving devices, enabling this work to be done at one-fourth the amount it would cost in the central office. The importance of this feature is self-apparent. Moreover, it enables the operation of the machine and the circuits to be thoroughly tested before shipment. When a Lorimer machine telephone reaches its destination, the only wiring necessary is the connecting up of the subscribers' leads and a cable between each section; work that any ordinary telephone employe can do.

Fig. 11 shows the power distribution board for the motor-generator charging plant, storage battery and operating circuits.

Fig. 12 shows all the parts of a percentage division before assembling. In the center are those of the cylindrical switches and rotary brushes; on the right, those of the signal register; on the left, those of the electro-magnetic clutch; on the center top, those of the relays. These parts are all standardized and are therefore interchangeable. They furnish a very clear idea of the perfect manner in which all the details of this invention have been worked out before putting it on the market and afford ample proof of the careful study and energy which have been brought to bear in connection with its design and construction.

The Lorimer machine telephone being built on the percentage system, it is possible to increase or decrease the number of percentage or connecting divisions in any section, at any time, without interfering with the working of the exchange. It is also possible to apportion the number of divisions to each section according to the amount of traffic they have to carry, allowing more divisions for business than for residence sections. In this connection it is worthy of special note that should all the divisions of a section be in use when a subscriber calls, he is made aware of the fact by the lever not rising. In that event the call is stored at the central office until a division becomes idle, when the waiting call is completed without any effort on the part of the subscriber, he being cognizant of the fact that his connection is made by the rising of the lever. This is apparently the first occasion on which a device has been completed which would store a call and afterwards complete it without further effort on the part of the subscriber.

Another feature not referred to is the testing of lines for crossed or grounded circuits. Once every four seconds as the brushes revolve round the decimal indicator every line is so tested.

From the somewhat lengthy description of the sending and completion of a call, it might appear that it is a slow process. On the contrary, calls are completed in from eight to ten seconds from the pulling down of the lever by the subscriber, and if the speed at which the machine is run was slightly increased, the time occupied would be even less. Moreover there is no perceptible variation in the time occupied in making all the connections in twenty-four hours. They are made with unerring promptitude and regularity at any hour, day or night. They are regulated by the speed of the machine and therefore cannot vary.

In regard to operating expenses, one attendant is ample to supervise an exchange of 2,000 subscribers. In respect to maintenance and depreciation, the simplicity of its design and the substantial nature of its construction will insure much for the Lorimer machine telephone. The manufacturers have every encouragement to believe that their claims for longevity will be verified.

The following figures comparing the Lorimer machine telephone with the automatic exchange recently installed at Grand Rapids, Michigan, are offered to show the importance of this invention to all who are interested in the control, operation, or use of telephone systems:

EXCHANGE OF 10,000 LINES.

	Grand Rapids. 1 Tier.	"Lorimer." 1 Tier.	"Lorimer." 2 Tiers.
Height	10 ft.	4 ft.	8 ft.
Floor space, length	350 ft.	150 ft.	75 ft.
Floor space, width	1,350 ft.	1,000 ft.	500 ft.
Floor space, area	472,500 sq. ft.	150,000 sq. ft.	37,5 0 sq. ft.
Relays	90,000	2,300	2,300
Relays per 100 section	900	23	2 i
Contacts	4,500,000	500,000	500,000

The officers of the American Machine Telephone Company are as follows: President, N. D. Neill; vice president, C. J. Kintner; secretary-treasurer and electrical engineer, G. W. Lorimer. As the perfected system stands to-day, it

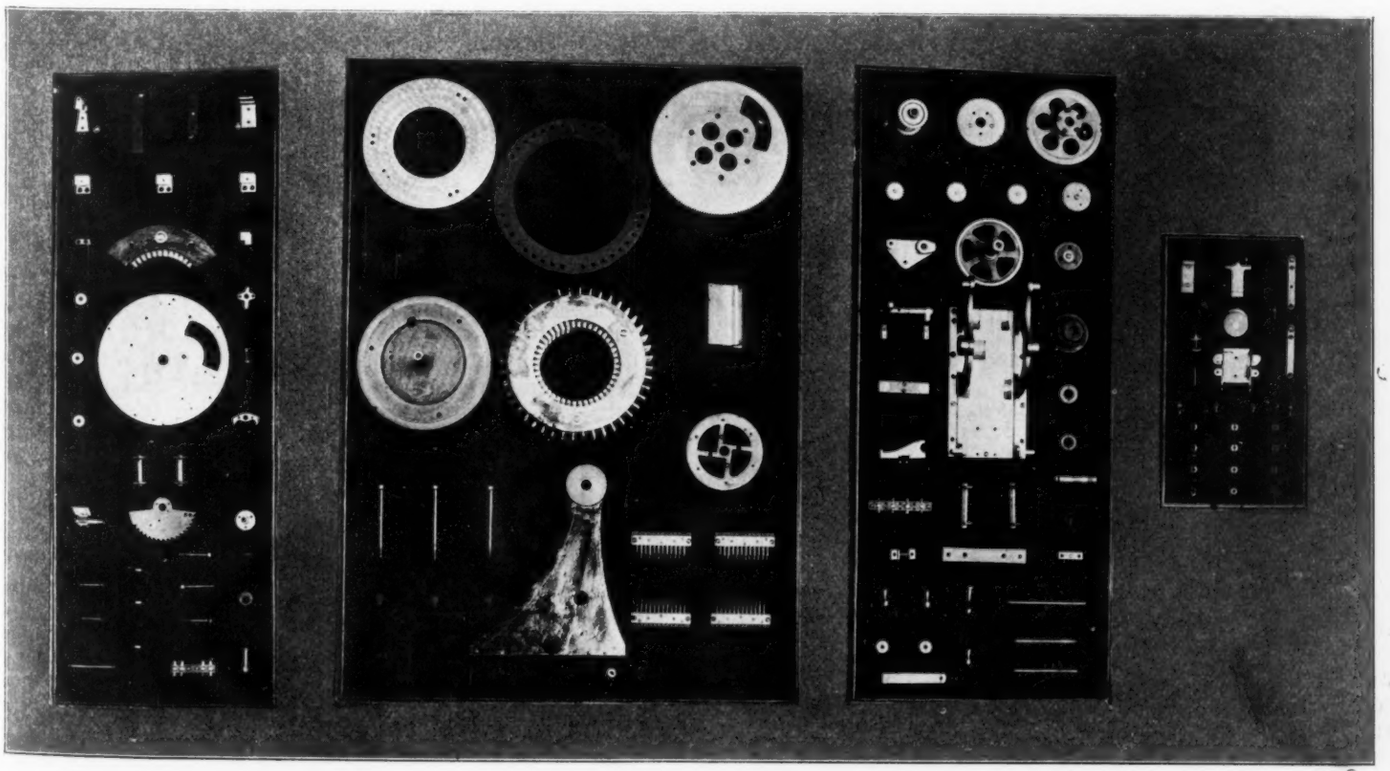


FIG. 12.

represents a cash outlay of several hundred thousand dollars. It is protected by patents in the United States, Canada, Great Britain, and almost every civilized country in the world. Rights covering the manufacture and sale of the Lorimer machine telephone in Ontaria and Quebec, Canada, have been sold to the Canadian Machine Telephone Company, Limited, which has established a factory in Toronto, where it has an exchange in operation and several in course of construction. With this exception the American Machine Telephone Company, Limited, owns and controls the patent rights for the whole world. Those who have been privileged to see this system in operation and to inspect the manufacturing plant at Piqua, Ohio, are forced to admit that so far as human intelligence is competent to pass judgment in such matters, the problem of machine telephony is solved, and as a result, a new era is about to open in which the largest exchanges will be able to give service at rates which, with manual system, would never have been possible. With the advent of this invention Independent telephony has greater opportunities in the future than in the past, and if it enables telephone managers to double their subscribers without increasing the rates, the next few years should see an unprecedented increase in the number of telephone users.

A SAMPLE OF BELL SERVICE.

—Washington Star.

"LIKE PATIENCE ON A MONUMENT, SMILING AT GRIEF."

The Russian journal *Rouskïa Viedomosti* gives some particulars of the recently installed central telephone exchange at Moscow. The building is of six stories, with basement. In the top floor is installed the instrument room, which serves 22,500 subscribers. The fifth floor is occupied by the accumulators and machines; the fourth by the cloak rooms, etc., of the staff; the third by dining room, drawing room, game room, library, etc. The second and the first floors contain the administrative offices. Finally, in the basement, are situated the store rooms, workshops and boiler room. The building is lighted by electricity and heated by steam. The installation has cost about 200,000 roubles.

IN KANSAS.

The Kensington (Kansas) Telephone Company are having a great deal of trouble with their rural telephones. Whenever there is a call at least a half dozen patrons take down their receivers to listen. Every evening the line is kept so busy that it is impossible to send in a call to central and corn shuckers gather at houses having telephones each evening and visit until a late hour. The old rule allowing boarders and guests has been rescinded and no one, if it can be helped, is allowed to use a telephone unless it be a subscriber. When the parents are out of doors at work the babies climb on chairs and take down the receivers and jabber away by the hour. The woes of the Kensington central are multitudinous.

THE POSSIBILITIES OF TELEPHONING OVER TRACKS TO A MOVING TRAIN.

This subject as expressed above divides itself naturally into two parts corresponding to a pair of meanings that can be given to the word "possibilities." It may safely be said that ever since the introduction of the telegraph as an accessory to railroading, the project of communicating directly with the engineer in his cab, or with the conductor in charge of the train, has been a subject of inventive scheming. For some time the project of doing away, partially or wholly, with fixed signals distributed in "blocks" along the railroad track and substituting therefor so-called "cab signals" operated by currents delivered to the locomotive through the rails, whereby every train is made to carry with it its own signals operative within a moving danger zone of track in front of and behind the train, has been seriously discussed, particularly abroad. That the scheme is regarded as feasible by some practical railroad men seems to give a sufficient warrant for the discussion of complete communication, either telegraphic or telephonic instead; although the substitution of either of these means of communication for the "cab system" used to deliver current to incandescent lamps in the cab would no doubt require detailed experiment in any successful reduction to practice.

The query "Can such telephoning be done?" naturally takes precedence as the first question of possibility. The fact that some highly ingenious inventive work of Phelps, Edison and others has shown a preference to use electrostatic induction in telegraphing to moving trains, rather than any attempt to make use of conduction from rails to wheels, does not necessarily mean that the latter method is impracticable. Since the Phelps invention was tried successfully on the Lehigh Valley Railroad a good number of years ago, much experience has been obtained with moving contacts in the course of the practical development of the trolley and of the third-rail system of electric traction. If it is possible to deliver large amounts of electric power with little loss to a fast moving train, there should be every encouragement for the use of moving contacts in handling telephone currents. It should be not impossible to minimize or eliminate difficulties such as "noise" due to variable resistance between, for example, a shoe and a rail.

To our view the query "Would it pay to do it?" is likely to be the ruling consideration. The force of conservatism, especially strong in its resistance to innovation in the operation of railroads, has hitherto prevented the general substitution of the telephone for the telegraph in train despatching, for reasons that come back to mere conservatism when analyzed. Moreover, the Phelps scheme above referred to was a brilliant success when tried, but died of inanition for sheer want of demand for its use. These considerations of fact bring us logically to the question of whether connection with the world by telephone would be more attractive to express train passengers than the facilities of the telegraph

were when tried as described. This is a question, not a matter to be decided offhand. The introduction of the telephone in multitudes of places where the telegraph would not be accepted—that is to say, the marvelous growth of the telephone service for business and social uses—might point to a commercial as well as an experimental success for a public telephone service from moving trains. The introduction of telephones at restaurant tables and in hospital wards in one or two of our largest cities has been a success, and might indicate that such an aid to the transaction of business or the killing of time while traveling would be acceptable to the public. These things can not be ignored as at least arguments in favor of the practicability of telephoning to moving trains. On the other hand, there are many inventions—such as "station indicators," a large class in the Patent Office—that consume an amount of ingenuity and labor on the part of their inventors equal to those required to perfect far more useful inventions, but have no real *raison d'etre* either in public need or in corporate saving. Wireless telegraph messages at sea and the demand that has grown up for them is not a sufficiently similar case to argue from on the present subject, because on the ocean the journey is longer, the sense of isolation and confinement is more oppressive. Moreover, the feat of overcoming such trackless isolation—hundreds of miles "out of sight of land"—has appealed to the public as a long stride ahead into new domains of human achievement; having thus the advantage of complete novelty over the feat of communication, even by so popular a means as the telephone, with a land-bound, land-encompassed railroad train.—*Electrical Review.*

Cuyahoga Company's Annual Meeting

The annual meeting of the stockholders of the Cuyahoga Telephone Company was held in the Electric building, Cleveland, on February 1, and the following men were re-elected to the board of directors: W. H. Lamprecht, H. A. Everett, R. A. Harman, B. Mahler, E. W. Moore, F. T. Pomeroy, F. M. Stearns, H. R. Newcomb, F. S. Dickson, J. W. Marsh, James R. Sprankle.

The financial report shows the property to be in very good condition considering the fact that it has been operating under difficulties, the main difficulty being the antiquated switchboard. It is expected, however, that the new switchboard will be installed by the first of March and President Dickson expects the common stock to show a good earning the coming year. The company now has $837,950 of its six per cent cumulative stock in the treasury to take care of the expenses incurred in getting the new switchboard and in other expenses which will be necessary in going after new business.

The bonded debt of the company is now $2,233,000, in addition to which it has current liabilities of $171,338.14 and deferred liabilities of $8,644.72. At the commencement of last year the company owed the Federal Telephone Company in the neighborhood of $500,000. This debt has been paid by the issuing of preferred stock.

The following is the financial statement for the past two years. It shows a net surplus for 1903 of $46,616, as against $542.07 for 1902, although in 1903 over $4,000 has been paid to employes as part of the profit sharing scheme and the dividends on the preferred stock have been charged out of the net earnings:

Earnings—	1903.	1902.
Rentals, telephone	$322,806.92	$313,857.21
Rentals, building	50,412.70	45,141.19
Tolls	20,149.98	20,813.19
Miscellaneous	3,120.60	6,040.55
Total earnings	$396,490.20	$385,852.14
Earnings—	1903.	1902.
Operating	$ 49,402.33	$ 59,052.47
Maintenance	102,734.82	114,689.45
General	45,281.75	36,546.83
Total	$197,418.90	$210,288.75
Percentage, expenses to earnings	49.36	54.59
Taxes	$ 19,041.62	$ 19,420.84
Expenses and taxes	$216,460.52	$229,709.59
Net earnings	$180,029.68	$156,142.55
Deductions—	1903.	1902.
Interest on bonds	$111,650.00	$111,650.00
Miscellaneous charges	4,790.88	3,092.37
Reserve for bad debts and depreciation	9,517.95	40,858.11
Reserve preferred stock	1,800	
Fee, secretary of state	1,500.00	
Total deductions	$129,258.83	$155,600.48
Surplus for period	$ 50,770.85	$ 542.07
Employes' share of profits (for six months)	4,154.69	
Net surplus	$ 46,616.16	$ 542.07
Deficit, December 31, 1902	$ 29,142.72	
Charges, earnings 1903	253.55	
Charges, expenses 1903	1,818.80	
Corrected deficit, December 31, 1902	$ 31,215.07	$ 29,684.79
Surplus, December 31, 1903	$ 15,401.09	$ 29,142.72

We append the annual report of President Dickson in full. It will be found interesting and fully describes the present condition of the property.

PROPERTY AND PLANT.

The cost of property and plant appeared on our books on December 31, 1902, as $5,714,242.85, and this amount had been reduced to $4,444,710 on December 31, 1903. This large reduction was brought about by the decrease in the common stock from $3,000,000 to $1,500,000 and the creation of $1,500,000 of preferred stock, which you authorized during the past year. This enabled us to use a portion of this preferred stock to settle the debt of the Cuyahoga Telephone Company to the Federal Telephone Company.

ADDITIONS TO PLANT.

During the year 1902 we expended $32,783.09 in additions to our plant, but as $2,478.82 of this amount, though necessary to our development, did not directly produce additional revenue, this amount was charged to expense account as maintenance, and the balance, $30,304.27, charged to construction. This expenditure produces an annual revenue of $8,949.71, or very nearly 30 per cent of the investment.

TELEPHONES.

On December 31, 1902, the total number of telephones in use was 10,168. During the year 1903 we took out 1,871 telephones, a large proportion being removed on account of non-payment of rentals. As we did not desire new business, pending the installation of our new equipment, we employed no canvassers during the past year, but notwithstanding this, the number of new telephones installed was 2,169, leaving a net gain of 298 telephones. The total number of telephones in use on December 31, 1903, was, therefore, 10,466. During the same period we put in fifteen new private branch exchanges and took out six, leaving a net gain of nine.

COLLECTIONS.

The collections for telephone rentals show a substantial increase. In 1901 the total collections amounted to $220,277.09, in 1902 to $296,425.20 and in 1903 to $319,298.78. The increase in 1902 over 1901 was $76,147.21, and 1903 shows an increase over the preceding year of $22,873.58, while the increase in earnings was but $8,949.71.

WAGES OF OPERATORS.

The operators on our switchboard are, I think, the poorest paid of our employes. The service, performed exclusively by girls, is very exacting at the best, and is made more so by the natural impa-

tience of the man at the other end of the wire. The man who will wait ten minutes for a street car without grumbling desires to call up the chief operator if compelled to wait one-third of a minute for telephone connection. We pay these girls an average of about $21 a month. This is not a living wage and should be increased. The new switchboard will enable us to reduce our force of operators nearly 20 per cent and we hope to share this saving among those who remain by increasing their salaries. To the best of my information, our wages are now about on a par with those paid by the Bell company in Cleveland, and in some cases are, I think, a little less. I believe it would be good policy to pay a little more for such work than do our competitors and thus attract to our service the most competent operators.

PROFIT SHARING.

In July last, in lieu of any increase in wages, we offered to put in operation a plan of sharing with our employes a portion of the profits made in our business. We did this, believing that the result would be an actual decrease in our expenses, coupled with an increase in efficiency. This plan has been widely commented upon by the press and warmly commended by many prominent men throughout the country.

We have been working under this system for six months now, and I believe the results achieved are sufficient to justify its continuance. From the report of the auditor we find that the surplus earned during the last six months of 1903 was $20,773.47. Our offer was to set aside 20 per cent of this sum as the share of our employes in the profits earned. This share amounts to $4,154.69, and is equal to about 6 per cent of each employe's salary for the half year, or in other words, a little more than one-third of the monthly wages. I did hope that they would earn at least one-half a month's wages in this way, and I believe that by combined effort the share of the employes can easily be increased to more than that proportion. We must have the cordial aid of our employes to give the best service and earn for you the highest profits, and I know of no better way of accomplishing this end than through the method we have adopted. I desire to continue our efforts along the same lines and would ask your cordial endorsement on this important matter. A resolution to this effect will be submitted for your consideration, and I urge that the views of the stockholders be clearly expressed.

STOCKHOLDERS.

To achieve perfect success, which is at this time clearly within our grasp, will require, however, not only the concentrated efforts of our employes, but at the same time we must have the active cooperation of our stockholders and of the owners of our bonds. We have at the present time 415 stockholders, and the value of the support which these stockholders can render to the company can scarcely be overestimated. This support we believe we have the right to expect. The Cuyahoga telephone is a local enterprise and nearly all of its stock and most of its bonds are owned by residents of this city.

We propose to give you the best possible mechanical appliances and the most competent employes, and the accomplishment of this means the most perfect service to our patrons. For this we propose to charge reasonable rates—rates that you will acknowledge are reasonable and fair for the service performed. If, after all this, the company does not prove a desirable investment to its owners, it will be because the owners were too short sighted to properly care for their own property and aid in its development.

Cleveland does not need the kind offices of a foreign corporation to supply its people with telephones, and such competition should not be tolerated any more than you would listen patiently to the urging of a Massachusetts company to permit them to supply you with water to drink, or gas to burn, or electricity to light your weary way to bed. Public service corporations should be owned by the people whose interests they attempt to serve, and the profits of the enterprise should be divided among those who make profits possible, and not go to swell the income of the residents of distant cities.

PREFERRED STOCK DIVIDENDS.

We not only desire to arouse the increased activity of our present stockholders, but we earnestly desire to increase the number of those interested financially in the success of this company. From the treasurer's report you will note that we have in our treasury 16,759 shares of the 6 per cent cumulative preferred stock of our company, which has a par value of $50 per share. We would like to distribute a portion of this amount among the users of our telephones. Thus far we have paid no dividends upon this stock, though we have more than earned them. The money available, however, was needed for imperative development, and, therefore, the declaration of our dividends was postponed; being cumulative, however, the dividends will have to be paid some time, if the company earns them, and this it has demonstrated its power to do. We would, therefore, like to propose to our telephone users that we will sell this stock to them, giving them the privilege of setting off the quarterly dividends upon their stock against the rentals due for the use of the telephones. Thus, if a user owned twelve shares of this stock, it would represent a par value of $600 and the dividends, payable quarterly, would amount to $9. If, at the same time he had a telephone on a rental of $36 per year the dividends would pay the rentals. This offer would, I think, appeal favorably to many, as it would give them an investment on which the income was absolutely certain as long as they continued to use the telephone, and would continue to be certain as long as the company did a profitable business. I would like to have you express your views on this subject before submitting it to our patrons.

NEW SWITCHBOARD.

The new switchboard is being rapidly put in place, and we still expect to have it in running order by the first of March next. This new board is what is known as the common battery full multiple type, equipped with the latest and most approved devices. It will enable us to abandon the old button system, which has been so annoying to our patrons—the exchange being notified of the subscriber's desire to talk by simply removing the receiver. The ultimate capacity of the board will be 18,000 lines, or would supply that number of main line telephones. As we will, however, offer to the public two and four party line service, with the latest improvements, we may possibly calculate that our average will be two telephones to each pair, and thus our ultimate switchboard capacity would enable us to take care of 36,000 subscribers. This switchboard is the largest in existence in any exchange but one—the new board lately erected in Buffalo being of the same capacity. Our sub-exchanges will add nearly five thousand telephones to our total.

That you may understand how difficult and exacting a labor it is to install this switchboard, I may call your attention to the fact that it requires in the exchange 1,473 miles of copper wire and 995,000 soldered connections are necessary to take care of our present development.

NEW RATES.

On the installation of the new board we will be prepared to give the best possible service to our customers, and we will then adopt a new schedule of rates. New subscribers on business telephones may be required to pay a larger sum than they do now, but the charge will be justified on account of better service and a largely increased number of available connections. We are advised by the ablest legal authorities in Cleveland that we have the right to readjust our rates without asking the consent of the municipal authorities. When these rates were first made by ordinance, it was the intention to provide service to about 1,000 subscribers in the center of the city. With the development of the system we are now giving over 10,000 connections for the same rates as formerly. Of course it is not possible for us to do this profitably. As the number of telephones increase the expenses increase more rapidly than the revenue, and if the company is able to give a larger number of connections it would be justified in charging an increased rate for the increased service.

If a company with 1,000 telephones charges $48 a year for a business telephone, the user pays $0.048 for each connection, but if the user is provided with ten times the number of possible connections at the same annual rate, he will pay one-tenth what he did for each connection. Obviously, in a city increasing as Cleveland is, the time will aturally come when any existing rates will become unprofitable. As service increases rates must increase, though by no means in as great a ratio. We will not, however, increase any rates until the increase in telephones clearly justifies our action, and even then, while some of our patrons will be asked to pay higher rates, our new system will enable us to give even lower rates to others.

MEASURED SERVICE.

We will be prepared to give the first thoroughly satisfactory measured service known to telephony by means of a registering device which we have secured, invented by James Plew of Chicago. By means of this attachment the user registers the call himself, has the number of calls constantly before his eyes, and the home office can read the number at any time by making an electrical connection. We propose to give a four-party service limited to fifty calls a month at a monthly charge of $1.75 with an additional charge of one cent for each extra call. We believe this rate will be popular with our customers and profitable to the company.

PROTECTION FROM BURGLARS.

We have entered into a contract with the Standard Protective Company, which will use our wires to connect with business places and dwellings for the purpose of notifying the exchange of an attempted entry by burglars and the exchange will notify the police station nearest the scene of the crime. All expenses attending this system will be borne by the Standard Protective Company and the Cuyahoga Telephone Company will receive a percentage of the gross earnings as its share.

We desire to thank you for your cordial support in the past and will ask you for still more active support in the near future. We believe that it would only require united effort on the part of all those interested to make this company one of the most efficient in the country and a source of great profit to its owners. It only requires concentrated effort on the part of us all to make this a steady dividend paver within a year.

Do not expect to get along without TELEPHONY any more than we would without a switchboard.—HORACE TRUMAN.

PERSONAL

E. N. Crawford is building an Independent telephone exchange at Jasper, Ala.

Joseph Maland has purchased the local telephone exchange at Frost, Minn.

M. M. Cadwell of Windom, Minn., will build telephone lines throughout Morrison county.

Frank S. Chapman has been appointed manager of the Kenton (Ohio) Telephone Company.

C. P. Lindsley, a prominent cedar pole dealer of Spokane, Wash., was a recent Chicago visitor.

E. Orr has been appointed superintendent of the Standard Telephone Company at Waukon, Iowa.

William Brunskill has been elected president of the Pontiac Telephone Association, Pontiac, Ill.

William Adler of Groveland, Ind., has purchased the New Maysville (Ind.) Telephone Company.

B. M. Stewart contemplates the building of an Independent telephone exchange at Carthage, Miss.

G. H. Cunningham has been appointed general manager of the Citizens' Telephone Company of Sumner, Ill.

J. F. Burley of Belvidere, N. J., has been appointed manager of the Washington (N. J.) Telephone Company.

W. G. Bailey has been elected president of the Harmony and Wellington Telephone Association, at Harmony, Me.

C. L. Moore has been appointed superintendent of the Bowling Green Telephone Company, Bowling Green, Ky.

F. L. Bills, the Chicago capitalist, has sold his interest in the Canton (Ill.) Home Telephone Company to local people.

W. B. Harper has succeeded Robert H. Polk as general manager of the People's Telephone Company, Birmingham, Ala.

M. F. Weaver of New Lebanon, Ohio, will construct a system of toll lines covering a considerable portion of the county.

C. A. Shook, formerly of Lima, Ohio, has been appointed manager of the Grayson County Telephone Company, Sherman, Tex.

Frank Zinnell, owner of the Carroll County Telephone Company, reports a number of improvements in his telephone properties.

C. Heines, formerly manager of Spencer (N. C.) Telephone Company, has decided to go to Albuquerque, N. M., and build a telephone system in that city.

D. C. Gould, who has been at Grand Rapids, Wis., representing the Stromberg-Carlson Telephone Manufacturing Company, has removed his headquarters to Portage, Wis.

R. K. Judy of Columbus, Ohio, formerly with the Ideal Construction Company, succeeds J. R. Longworth as manager of the St. Mary's Telephone Company, St. Marys, Ohio.

Mr. A. Meinema, who has for the past four years represented the M. B. Austin Company of Chicago, in the state of Wisconsin, has accepted a position with The Vought-Berger Company, and will represent them in the Northwest with headquarters at Chicago. Mr. Meinema, together with his brother, Mr. J. Meinema of the same company, started February 15 for Cuba, where they will spend a month in the interests of Vought-Berger apparatus.

Frank C. Perkins has carried on for six years a school for teaching electricity at Buffalo, N. Y., known as the Cataract Electrical School, and has lately developed its field considerably.

Mr. Frederick D. MacMaster, formerly with the Library Bureau of Chicago, will represent The Vought Berger Company in the state of Minnesota, making his headquarters at Minneapolis.

Ray H. Manson has resigned his position as sales engineer of the Kellogg Switchboard and Supply Company to accept the position of first assistant engineer of the Dean Electric Company, Elyria, Ohio.

W. S. Chase, sales manager of the National Acme Manufacturing Company of Cleveland, Ohio, has taken passage from New York for England and the continent on a business trip which will last about two months.

Mrs. H. A. Douglas, the wife of H. A. Douglas, manager of the Citizens' Telephone Company of Jackson, Mich., died while on a pleasure trip to Chicago. Mr. Douglas' many friends will learn of his loss with deep regret.

Harry C. Griffin of Chicago, a representative of the John R. Roebling's Sons Company, was recently presented with a son. Mr. Griffin has been married eleven years and his wife's anniversary present was an eleven-pound boy.

James F. Cummings recently secured the contract for the laying of the conduit for the St. Petersburg municipal telephone and telegraph lines. The conduit is being manufactured at Raritan, N. J., by the National Fireproofing Company.

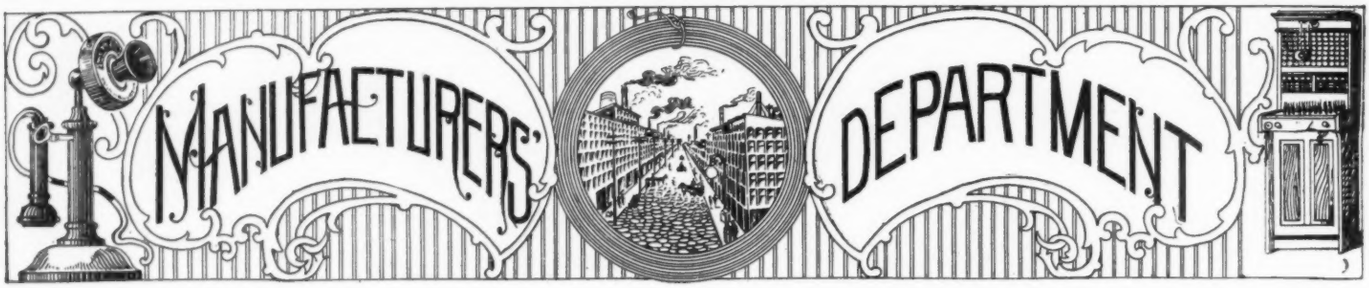
Clyde Brenton of Dallas Center, Iowa, one of the largest stockholders in the Mutual Telephone Company of Des Moines and also of the Hawkeye Telephone Company, is behind a scheme to build Independent exchanges in Council Bluffs and Omaha.

L. G. Bowman has left the North Electric Company of Cleveland to accept the position of general manager of the Eastern Telephone Manufacturing Company of West Chester, Pa. The latter company has a well-equipped factory and is manufacturing everything pertaining to magneto and common battery work.

S. H. Campbell has purchased an interest in John H. Fowler & Company, cedar producers and dealers, Chicago, and will have the management of the sales department for John H. Fowler & Company, The Fowler-Jacobs Company and the Elmore-Fowler-Jacobs Company, all companies engaged in the cedar industry. Mr. Campbell will travel through the central western states, and while pushing the sale of the company's cedar product will make a specialty of cedar poles.

George H. Pierce, formerly the New York state representative of the Stromberg-Carlson Telephone Manufacturing Company, has recently accepted a position with The Vought-Berger Company of La Crosse, Wisconsin, and will represent that company in the state of Iowa. His headquarters will be in Des Moines, 600 5th street, where he will carry a small stock of telephones for immediate shipments, and a switchboard or two in readiness for emergency orders in cases of accident or disaster. At the present time Mr. Pierce is making a short trip through the state of New York for The Vought-Berger Company, before taking up his active work in Iowa.

Telephones are placed on long route electric and steam cars, so that when stops are made, a connection will enable passengers to avail themselves of the advantage of the telephone.



THE ELECTRICAL SUPPLY COMPANY

In attempting even a brief synopsis of the business of the Electrical Supply Company, Madison, Wisconsin, it may prove of interest to relate some of the incidents of the life of the company's president, L. W. Burch. These trivial affairs seem to have had a large share in the development of an industrial enterprise that is wielding a large influence in its chosen field.

L. W. BURCH.

In the larger cities, before the days of the telephone, the fleet-footed messenger was called into service. He was generally a privileged character of high standard efficiency. At that time it was considered a very respectable position for a young boy to occupy, and in an immaculate suit of blue and brass buttons, clean hands and face, bright eyes and shoes, he usually made a favorable impression as to his ability.

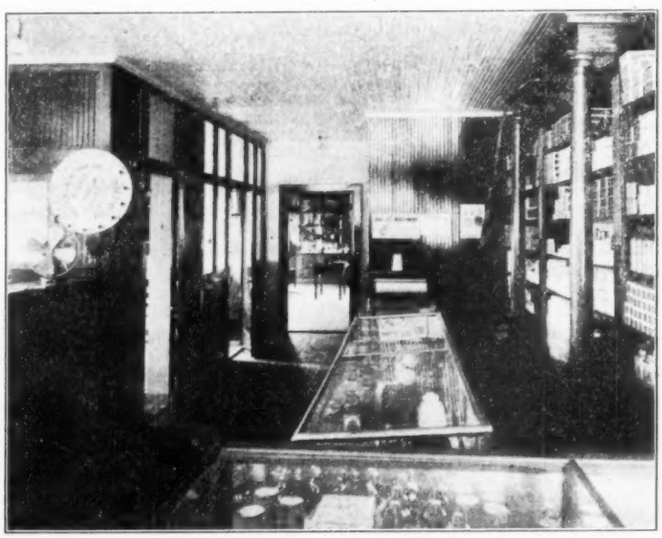
In this earlier day the American District Telegraph Company of Detroit employed eight messengers, with J. U. Mackenzie as superintendent. Mr. Mackenzie taught Thos.

FRONT OF STORE.

A. Edison telegraphy at the little station of Mt. Clemens, Michigan.

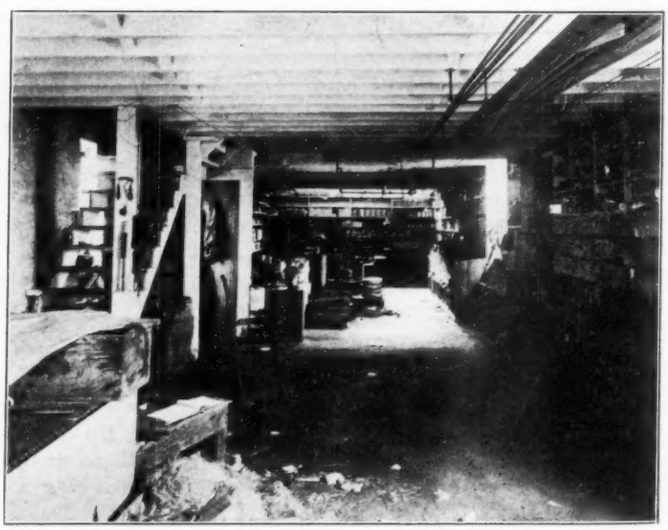
One morning there were three new names added to the list and three raw recruits brought into line, one of the number being L. W. Burch, who was enlisted as No. 10. Mr. Burch dwells with a great deal of feeling upon this time of his life when he can look back and remember the kindness of his superintendent, who stood over six feet tall, wore a silk hat, was somewhat bow-legged, and for the amusement of the little boys who happened to be in the office at various times, used to blow rings of smoke one after another and through each other and laugh as heartily as they did. One of young Burch's companion messengers was Mr. Mackenzie's son, who chanced to be the little child that Mr. Edison saved from being run over by a train and for which Mr. Edison was rewarded by Mr. Mackenzie teaching him telegraphy.

About this time telephones were being talked about and



SALES DEPARTMENT.

a switchboard was erected in the district telegraph office and ten telephones connected to various parts of the town. It was thought then that telephones were merely to play with. They were used to listen to a clock strike, or to the playing



SHIPPING DEPARTMENT.

of a mouth organ and such other trivial matters. It was not supposed that the telephone could be used for serious business affairs.

Mr. Burch recalls having been sent to a gentleman's of-

fice to inform him that his wife had telephoned requesting that he come home earlier than usual to his lunch. The gentleman asked him if he had been out to his residence, and on being informed that the message had been telephoned, the gentleman was so amused that he went from office to office explaining the workings of this wonderful apparatus.

The first introduction the messengers had to the telephone was when Mr. Mackenzie had an instrument placed in his residence. The messengers were informed that through the use of this new invention Mr. Mackenzie would be able to tell whether the boys were in proper condition as to their neatness of appearance and whether or not they carried on any boisterous conversation. When the apparatus was ready to be tested the messengers were formed into line and one after another they were permitted to carry on a short conversation with Mr. Mackenzie, who was at the other end of the line. When the switchboard was ready for operation young Burch and another messenger were given charge of it. It was then known to be the first switchboard installed for commercial use in the United States. The installation was made by Thos. Rousseau, now deceased.

Mr. Burch's next move was to Chicago to enter the employ of the Central Electric Company as shipping clerk, in

VIEW IN ELECTRICAL FIXTURE DEPARTMENT.

which business he was engaged until the organization of the Metropolitan Electric Company, with which he accepted a position as traveling salesman.

The territory that most appealed to Mr. Burch was Wisconsin and Minnesota and his acquaintance gained throughout this territory was highly satisfactory to him and he determined to enter into business for himself. After due consideration and research he found that Madison, Wisconsin, was, in his opinion at least, the coming center of distribution for all classes of merchandise and he determined to settle there, much against the advice of many old timers in the business.

By hard work, conscientious dealings, previous knowledge of the business, and also on account of his being a practical electrician and construction man, he was able to make his company grow from a very small beginning to its now robust and healthy condition. The company as it stands today is exceptionally strong financially. The new building into which the company moved last spring was built for it and while the exterior claims no special attention, the interior is fitted up in a manner becoming a first-class supply house. All fittings are in oak finish and its appointments are complete throughout. A large and commodious warehouse is situated on a side track where two or more cars can be handled at a time.

The Electrical Supply Company has a large amount of trade throughout the territory it covers. Among the specialties it handles are genuine long leaf yellow pine cross arms, which come from Missouri.

Among other things which the company handles are the New York Insulated Wire Company's insulated wire and John A. Roebling's Sons Company's B. B. telephone wire. It also owns and controls the Ritter patent soldering iron, which is known to all electricians throughout the country, and the A. K. Duplexer, which has had its first introduction the past season and has met with great success. The company also handles other specialties and carries a large stock of general electrical merchandise.

Mr. Burch has been instrumental in establishing a number of electric light plants and telephone exchanges in Wisconsin. His efforts to increase the membership of the Northwestern Electrical Association and the Wisconsin Independent Telephone Association have met with deserving success. The organization of the Independent Telephone Association was in a great measure due to his individual efforts.

The Electrical Supply Company is especially well located for the distribution of electrical supplies, as Madison is the center of a thickly populated territory which is connected by railroad and telephone service. Orders can be given over the telephone and shipments made within a few hours after they are received. As a matter of fact a large percentage of mail orders have dropped off very perceptibly since the use of the telephone has become general, especially in this territory.

STANDARD UNDERGROUND CONFERENCE.

The annual conference of the branch office managers of the Standard Underground Cable Company, with the general sales, the manufacturing, the construction and the executive departments of the company, was recently held in the general offices of the company in the Westinghouse Building, Pittsburgh, the session covering three days. The report of each manager for the year 1903 and the business prospects for the year 1904 were presented and discussed, together with ways and means for rendering more efficient service, in every department, to the customers of the company, who now number considerably over one thousand. A pleasant social feature of the occasion was a theater party given by J. W. Marsh, vice-president and general manager of the company, to the visiting managers. The branch office managers attending the meeting were Charles J. Marsh and George L. Wiley from the New York office, Frank Clark Cosby from the Boston office, T. E. Hughes from the Philadelphia office, and J. R. Wiley and E. J. Pietzcker from the Chicago office.

A NEW BOOK.

"Telephone Troubles, Their Cause and How to Remedy" is the title of a new book just issued by the advertising department of the Stromberg-Carlson Telephone Manufacturing Company, Chicago, and Rochester. The author of the book, F. L. Martin, states in its preface:

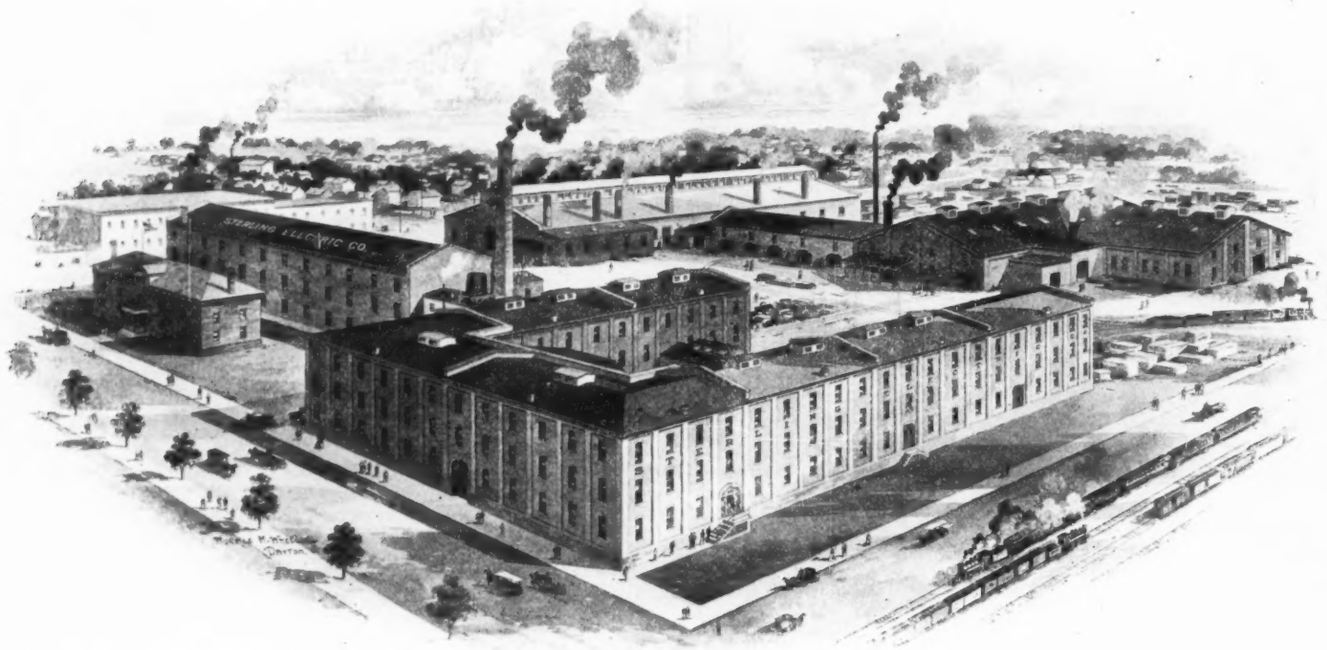
"In this little booklet we have attempted to enumerate the troubles that sometimes occur in bridging telephones and tell in as plain language as possible how to remedy them. No attempt has been made to make it a complete telephone manual, but more especially a book of information for those who have not had any experience with a telephone."

The price of the book is ten cents. Send orders to Stromberg-Carlson Telephone Manufacturing Company, Chicago, and mention this publication when writing.

Sterling Electric Company, Lafayette

The Sterling Electric Company, Lafayette, Indiana, shows one of the most phenomenal growths of any manufacturing concern in the country. The company was incorporated under the Illinois laws and commenced business in a small way at 71 West Adams street, Chicago, in 1898, manufacturing switchboards and protective devices for the Independent telephone field, the company being capitalized at $30,000. In December, 1899, the company removed its plant to Lafayette, Indiana, increasing the capital stock to $100,000, at the same time taking up the manufacture of telephones.

The growth of the business was so rapid that the capital stock was increased to $150,000 in 1901, and the company placed on the market its common battery multiple switchboard, which made its line of telephone apparatus complete and placed the company in the front rank, as one of the largest manufacturers of telephone equipment in the world.



STERLING ELECTRIC COMPANY'S FACTORY, LAFAYETTE, INDIANA.

The Sterling common battery multiple switchboard met with instant favor, and in February the capital stock was again increased to $300,000 to take care of a business which had grown in six years from a $30,000 capitalization to one of $300,000, showing what energy and ability can accomplish in the Independent telephone manufacturing field.

The company owns its own property and building, which covers two acres of ground. The accompanying illustration gives a fair idea of the Sterling factory, which is one of the largest and most modern in the country, having a floor space of nearly 200,000 square feet, with a capacity for one thousand workmen. The equipment throughout is of the latest and most modern pattern, individual motors being used for power.

The Sterling Electric Company manufactures everything that goes into its completed product except hard rubber, porcelain and glass. Even the lumber is purchased in the log and sawed on the premises. The Sterling woodworking plant being one of the most modern of its kind in the country.

The shipping facilities are first class, the Chicago, Cleveland, Cincinnati and St. Louis Railway and the Lake Erie and Western Railway have sidings which run into the Sterling shipping yard.

All the foregoing shows conclusively that the Sterling Electric Company is a very material factor in the Independent telephone manufacturing industry, and its past record is one of progress and permanency. The recent increase of the capital stock, and the investment of $100,000 new money is a very strong indication of the future position of the company, and of the confidence in its management by the stockholders. It is the intention of the management to continue the aggressive policy which has made the company what it is, and to branch out in new lines, and make the year 1904 a record breaker.

At the recent stockholders meeting the personnel of the directors was changed. The board of directors was increased from five to nine and are as follows: Walter E. Doolittle, president; Henry A. Taylor, vice-president; William R. Coffroth, secretary and treasurer; Charles M. Murdock, A. F. Ramsey, William Wallace, Charles H. Ankeny, John F. Schnaible and John Wagner, Jr. The personnel is peculiar in its representation of strength. H. A. Taylor, owning The Taylor Bank, Lafayette; Chas. M. Murdock, cashier Merchants' National Bank, Lafayette, and street car magnate; A. F. Ramsey, president of the Citizens' National Bank, Crawfordsville; William Wallace, president Lafayette Loan & Trust Company, also vice-president First National Bank, Lafayette; C. H. Ankeny, jeweler and bank

director; John F. Schnaible, president of Schnaible & Company, manufacturers, also bank director; John B. Wagner, Jr., assistant cashier Merchants' National Bank. The Sterling Electric Company has enrolled among its stockholders five presidents of banks and four bank cashiers. No better evidence of the stability of the Independent telephone movement and the future outlook for its success and growth as well as the future of the Sterling Electric Company can be cited than the fact that banks and bankers see in it a permanent, safe and paying investment. The active management of the Sterling Electric Company is in the hands of its president and its secretary, William R. Coffroth. Mr. Coffroth is peculiarly fitted for the duties devolving upon him in this position. He is one of Lafayette's brightest young attorneys, is a leading politician, is identified with many of the progressive institutions of Lafayette, and is considered a safe, shrewd business man of means and a pusher. The president of the Sterling Electric Company, Walter E. Doolittle, is too well known to Independent telephone men to need extended mention. The Sterling Electric Company is a monument to his untiring energy. He has been the guiding spirit of the company since its inception, and its success has been due in a large measure to this man who used brains, pluck and hard work to build a business, of which any man might be proud. He is a young man from whom much will be expected, and by whom much will be done, and in the future success of the Sterling company Mr. Doolittle will be the biggest factor. His broad aggressive way of doing things will make for himself and company a name in the commercial world. With two such men at the helm as Doolittle and Coffroth the future of this prosperous Indiana manufacturing company is assured.

W. E. DOOLITTLE.
PRESIDENT STERLING ELECTRIC COMPANY.

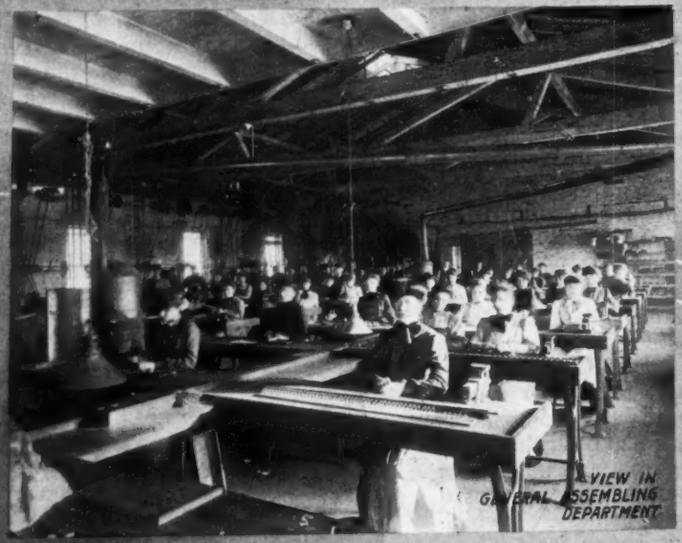
Some of the common battery multiple equipment now being completed by the company might be mentioned: Springfield, Freemont, Elyria and Chillicothe, Ohio, and Gainesville and Denton, Texas. The switchboard and telephone orders on hand are keeping the factory busy, while the outlook for the present year is the most promising in the history of the movement. It goes without saying that the Sterling Electric Company with its apparatus and facilities will get its share of the business.

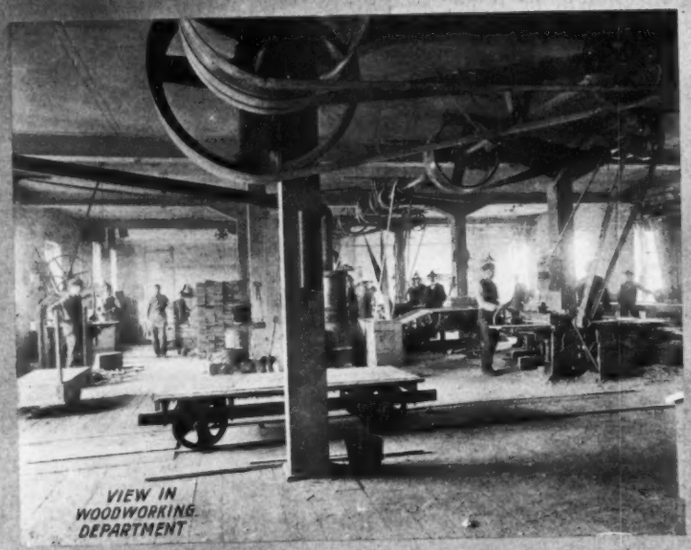
W. R. COFFROTH,
SEC. & TREAS. STERLING ELECTRIC COMPANY.

Sterling apparatus is used in every state in the Union, and many large shipments have been made into foreign countries. The export business of the company will keep many small factories busy.

On the two pages following are shown some views taken in the Sterling factory. The view of the general offices does not give an adequate idea of the space covered. The room is about one hundred feet square, and is arranged in departments, so that the work done is systematic. Immediately off the general offices are the rooms of the officers of the company, the directors' room, engineers' offices, etc. The views shown in the machine department show the arrangement and plan of the machinery. It will be seen that there is no waste space. Every available foot of room is occupied. And this is true throughout the entire machinery departments of the factory. In the woodworking department view is shown where the woodwork is made that is used in Sterling apparatus. This woodworking department covers an entire wing of the factory. The one view, however, conveys a general idea of the plant.

The Sterling factory is noted throughout the state of Indiana, and in fact throughout the country, as one of the largest and most up-to-date of its kind, and is pointed out to visitors to Lafayette as a model plant, of which the town is justly proud.





SOME VIEWS IN
STERLING ELECTRIC
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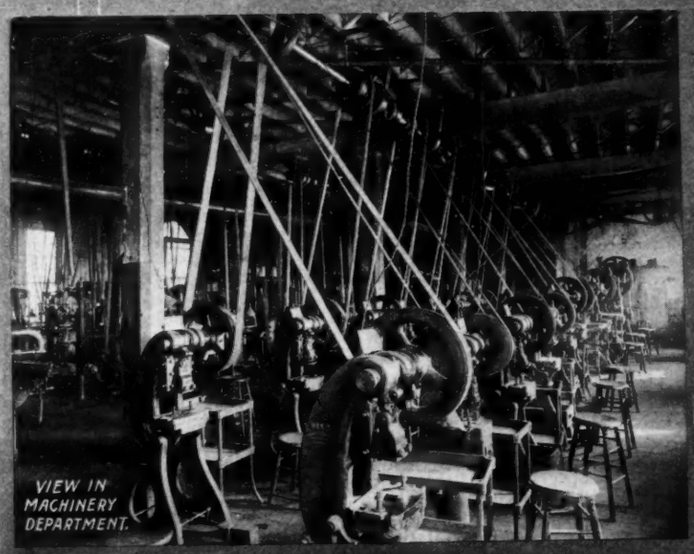


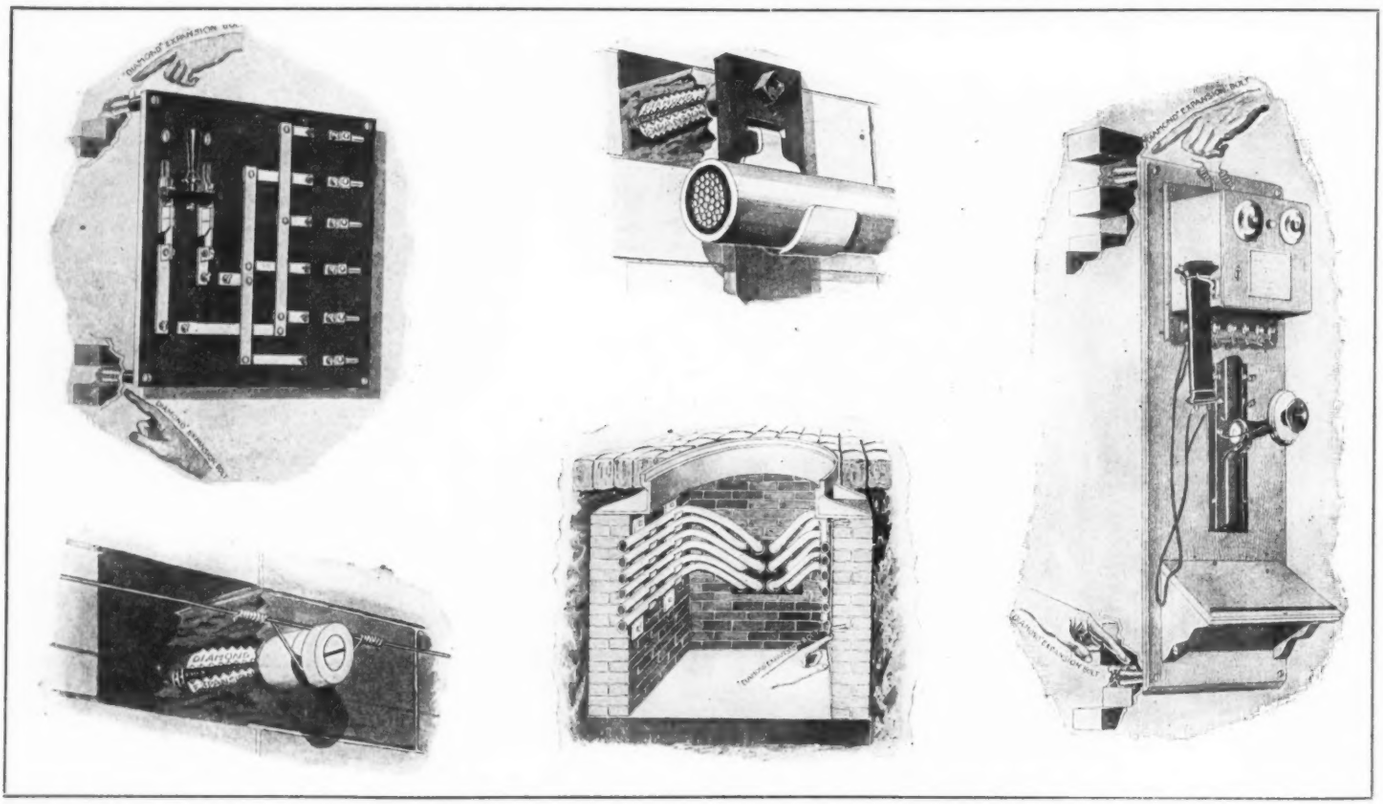
SOME VIEWS IN
STERLING ELECTRIC COMPANY'S
FACTORY

DIAMOND EXPANSION BOLTS.

The expansion bolt, shown in the illustrations, will be of interest to architects, engineers, telephone contractors, masons, iron workers, electrical workers, and any one requir-

ing means for securely fastening structures, apparatus, instruments, etc., to stone, brick, concrete or masonry of any description.

The Diamond expansion bolt is more economical and insures a more reliable fastening than wooden plugs, sulphur, wedge bolts, leaded work, etc. It has several important features of superiority over any other style of expansion bolt. It is the simplest expansion shield made, having but two parts. It is the only style of expansion shield that does not require the use of a pipe sleeve and bolt and wedge nut with machine cut thread. It is the only style of shield with which a bolt having a lag screw thread can be used and in which the expansion commences as soon as the bolt is started in, this operation in other bolts not taking place until the bolt is screwed in and the wedge nut drawn out.



All of the leading lag screw manufacturers in the United States have adopted a standard thread for lag screws to fit Diamond shields.

There are no loose parts to get lost. When properly set the Diamond expansion shield cannot be loosened except by actually breaking the material from around it, but at the same time can be easily removed by unscrewing the bolt.

It will last as long as the wall, or may be taken out and used on other work. Standard sizes from one-eighth-inch diameter to one and a quarter-inch diameter bolt are always kept in stock, but larger sizes can be furnished when desired.

A large order was recently filled for Diamond expansion shields to fit a 2-inch diameter bolt.

The Diamond Expansion Bolt Company, 9 and 15 Murray street, New York, manufactures the Diamond bolt and other specialties which are used in telephone construction work. The company will send complete description and catalogue free and invites correspondence.

PREVENTION OF TUBERCULOSIS.

An aseptic and sanitary attachment has recently been placed on the market by the West Disinfecting Company, New York, as advertised in this issue. In view of its usefulness and the fact that it keeps the telephone mouthpiece free from dust, deodorized and disinfected, it has also a higher value in preventing the transmission of disease from one person to another as spoken of by the following instances:

At the thirty-first annual meeting of the American Public Health Association, recently held in Washington, considerable interest was manifested in the question of the prevention of tuberculosis, and attention was called to the danger attending the use of infected milk; the riding of tuberculosis patients in street cars and other public conveyances, and to the fact that blankets used in sleeping cars were cleaned but once in six months. To me, however, there seems to be equal peril in another direction, though I have seen no reference made to it. I refer to the public telephone. The transmitter of a public telephone would be an ideal location for the reception of particles of sputum containing the bacilli, deposited there by tuberculosis individuals while using the telephone. When this sputum becomes dry it would be readily inhaled by others using the telephone, especially when it is necessary to place the mouth close to the transmitter in order to be heard at the other end of the line. Any one who has stood for five or ten minutes with his mouth glued to the transmitter, in a frantic effort to make the man at the other end understand what is said, has only to consider the matter a moment to realize the danger of the situation. It may not always be necessary to place the mouth so close to the transmitter, but observation demonstrates that the majority of people do so, whether needful or not.

The question has lately been brought rather forcibly to my mind. In this institution all the wards are supplied with telephones, with a central office in the main building. About six months ago a young lady was employed in the office whose duty, among other things, was to attend the telephone, though all the officers and clerks used

it frequently. Her health was not good at any time, and after she had been here some five months the matter of her health was looked into more closely and her sputum was found to be full of tubercle bacilli. Another lady stenographer, who also attended the same telephone, and who resigned just before the above disclosure was made, is now reported as having tuberculosis. Whether the connection between these two cases is as direct as it seems to be, and whether the infection was carried by means of the telephone, cannot be known positively, but it is so very probable that I believe a note of warning would not be amiss.—J. W. WHERRY, M. D., in *American Medicine.*

METROPOLITAN EXPANSION PLUG.

One of the latest, and an important addition to the line of practical specialties manufactured by the Yonkers Specialty Company, Yonkers, N. Y., is the Metropolitan Expansion Plug, which is meeting with favor wherever used. The plug consists of a split cylinder of creosoted wood with a cylindrical hole tapered at one end for the reception of an expanding pin.

Figure 1 shows the plug in prospective with screw inserted, and Figue 2 shows the plug being driven in by means of the driving tool.

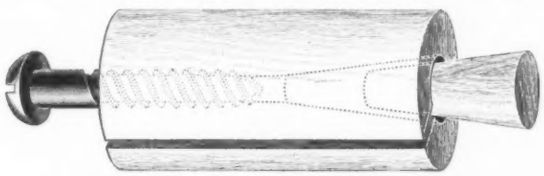


FIG. 1. METROPOLITAN EXPANSION PLUG.

The company claims the following advantages for this device:

First: Its low cost; it being cheaper than any of the metallic expansion bolts which are on the market.

Second: Its durability. It is made of thoroughly dried dowel pin wood and creosoted so that the difficulties due to shrinkage and decay are entirely avoided.

Third: It is adapted for a variety of sizes of both screws and spikes. It is particularly adapted for screw work, the small cylindrical hole affording a ready means for inserting the screw which cuts its own thread in the shell, as it is driven in.

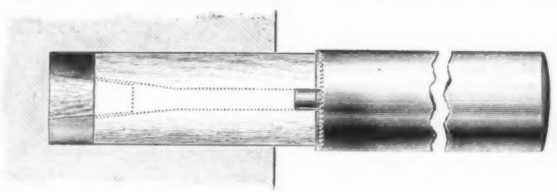


FIG. 2. METROPOLITAN EXPANSION PLUG.

Fourth: It has an enormous holding power and will support as great a weight as any of the metallic expansion bolts. The hole for the reception of this plug should be drilled with a star or a pipe drill of the exact size of the plug, and the plug should be driven in by means of the driving tool, which is designed to prevent the outer end of the plug from breaking up as it is driven in, and to preserve a smooth hole for the insertion of the screw of spike. The company invites correspondence and will send descriptive matter and prices upon application.

NEW PHONALARM SYSTEM.

A private demonstration of the new burglar system known as the "Phonalarm" was recently made at the office of the Standard Protective Company in the Electric building, Cleveland. This test was made in the presence of officials of the Federal and Cuyahoga Telephone Companies and other persons interested in the telephone business in various cities. This system consists of an apparatus to be connected with the telephone by means of which the opening of a door or window is instantly transmitted over the telephone wires to the telephone exchange, and from there communicated to police headquarters. One of the features in the system which has never before been accomplished in any other burglar alarm system is a unique arrangement by which the breaking of a pane of glass transmits the alarm as effectually as though the window were raised. The "phonalarm" people have opened offices in the Electric building in charge of L. S. McCreary. The recent test was successful in every way and the telephone experts present were greatly pleased with the showing made. A complete alarm system has been installed in the Electric building, and demonstrations of its workings will be given daily for the benefit of those interested.

EUREKA EQUIPMENT.

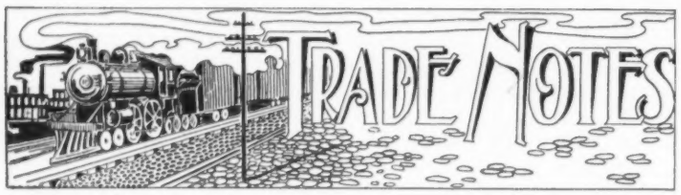
The Belvidere Telephone Company at Belvidere, Ill., in order to improve its service and render it more rapid, has contracted with the Eureka Electric Company of Chicago and Genoa, Ill., to equip its 800-line express switchboard with the Eureka flashlight transfer system, consisting of fifty-six trunking lines having lamp signals at each end of the trunk. This trunking system will be able to accommodate 1,000 lines, as there will soon be that number in use. The board is also to be equipped with new listening and ringing keys and Eureka flashlight supervisory. The addition of the above apparatus gives the operator complete flashlight supervision over all calls, both trunking and those in her own section and will greatly facilitate her work, enabling her to take care of more calls than would otherwise be possible. This system was originated by the Eureka Electric Company, and is in successful operation in a large number of exchanges to the complete satisfaction of the exchange managers. This system is applicable to both new and old switchboards, either of the Eureka or other manufacture.

The Eureka company is also prepared to furnish its new Bell style self-restoring ring down switchboard on which it has been favored with many orders recently. This drop has met with universal favor with telephone engineers and is a new departure from the regular restoring drop. The new bulletin describing this board is now ready and will be sent upon request.

Among recent shipments are one Eureka magneto express switchboard of 400 capacity to McPherson Telephone Company, McPherson, Kans.; one 100 capacity switchboard to Lawton Telephone Company, Lawton, Ia.; one 100 capacity switchboard to Indiana Electric Company, Hillsdale, Ind.; one 100 capacity switchboard to Citizens' Telephone Company, Newport, Ind.; one toll line switchboard to J. E. Briglin, Orleans, N. Y.; one 100 capacity switchboard to Larue County Telephone Exchange Company, Hodgenville, Ky.; one combination telephone and switchboard and one 100 capacity switchboard to Quincy Mining Co., Hancock, Mich.; one 100 capacity switchboard to James A. Helm, De Soto, Ill.; one 100 capacity switchboard to Charles Causey, West Union, Ind.; one 100 capacity switchboard to Mitchell Telephone Company, Georgia, Ind.; one 50 capacity switchboard to Theresa Union Telephone Company, Theresa, Wis.; one 25 capacity switchboard to Morgantown Telephone Company, Morgantown, Ind.; one combination telephone and switchboard to J. W. Reynolds, Simpson, Ill.

Also large shipment of telephones for Valparaiso, S. A., and shipment of 100 telephones for San Salvador, C. A.

I would not be without TELEPHONY for double the cost. The articles are so clear and concise that any one who is interested may readily comprehend them.—E. B. CARLEY.



THE CROCKER-WHEELER COMPANY, Ampere, N. J., announces that its Chicago office has established headquarters for western Ohio at 1232 Union Trust building, Cincinnati, Ohio, with Mr. H. A. Brown as representative.

CONKLIN'S SELF-FILLING PEN is a new departure in fountain pens. S. A. Dinsmore, 5740 Princeton avenue, Chicago, has the Chicago agency for this pen, and is selling it to telephone men and others. Full information and prices will be sent upon request.

THE EDISON STORAGE BATTERY COMPANY, Orange, N. J., illustrates and describes in an attractive catalogue the new "Edison" storage battery. This catalogue will be found interesting to those studying the storage battery question, and will be sent on request.

THE AMERICAN ELECTRIC FUSE COMPANY, Chicago, Adrian, and New York, has followed up its large catalogue with a number of leaflets illustrating and describing new protective devices. These, together with the catalogue, will be sent free upon request.

PLEW & MOTTER, 305 Dearborn street, Chicago, have a new triple expansion binder which has many attractive features. This company manufacture loose leaf systems for telephone companies, and will be glad to correspond with the accounting departments, or others interested.

THE WESTERN TELEPHONE MANUFACTURING COMPANY announces the removal of its factory from Winthrop Harbor, Ill., to the Atlantic building, 42 West Jackson boulevard, Chicago. The general offices of the company have also been removed to the Atlantic building.

THE VOUGHT-BERGER COMPANY, La Crosse, Wis., manufacturer of telephones and switchboards, has been compelled to run its factory day and night to keep up with its orders. The company reports a largely increasing business and states that all orders are being filled promptly.

QUEEN & COMPANY, INC., of Philadelphia, has issued a handsome and instructive circular celebrating the fifty years of its existence, 1853-1903. It gives a synopsis of the history of the house, illustrates some of its leading apparatus, etc., and gives views also of its laboratories, factories, etc.

MANHATTAN ELECTRICAL SUPPLY COMPANY, Chicago and New York, has just issued a new reduced price list on a number of the company's specialties and supplies. The company's new catalogue will be ready for distribution by April 1. Those who desire a copy of the book should make application now.

THE CALENDAR BLOTTER, issued by the McRoy Clay Works, Brazil, Indiana, and Chicago, for February is on a par with its predecessors. It is printed in color and has a verse entitled "Poor Man." Those who desire the complete set of these Calendar blotters should send their names to the company at Chicago.

THE CHICAGO WRITING MACHINE COMPANY, Chicago, reports a heavy demand for the Adjustaphone, which has met with such marked favor from up-to-date exchange managers. The company has issued some new printed matter and is making attractive prices for the month of March. Correspondence is solicited.

"DIAMOND EXPANSION BOLT AND SHIELD" is the title of two booklets recently issued by the New Jersey Foundry and Machine Company, 9 Murray street, New York. The books illustrate and describe the company's new Diamond expansion bolt and shield and Diamond adjustable cable hanger. Both books will be sent upon request.

CHICAGO FUSE WIRE & MFG. CO., Chicago, has issued No. 15 of its admirable little series of catalogues and price lists. Its experience with tested fuse wire extends over fifteen years, and its list now includes the latest ideas, practice and developments in that field. Special attention may be called to its "Union" fusible links, "Union" switch outlet boxes, etc.

THE INTERNATIONAL BRASS & ELECTRIC COMPANY, 76 Beekman street, New York, has issued its 1904 catalogue of the line of goods manufactured by it. The catalogue contains illustrations and price lists of induction coils, automobile coils, sparkers, switches, connectors, etc. The company manufactures these articles and many others, and carries goodly sized stocks.

JOHN H. FOWLER, Chicago, producer and dealer in cedar products, has recently been compelled to double the general sales offices of John H. Fowler & Company, The Fowler-Jacobs Company and the Elmore-Fowler-Jacobs Company. Mr. Fowler being president of all three companies. This move was made necessary by the rapidly increasing business of the Fowler companies.

BUSINESS IN NEBRASKA has been very good since the first of the year, according to a report received from the Chicago Telephone Supply Company, of Elkhart, Ind. Since the first of the year that company has sold complete exchange equipment for fiteen new exchanges in that state. In this number is not included any equipment sold to exchanges previously in existence.

CHARLES F. SPEED, Ann Arbor, Mich., has recently gone into the manufacturing business and is offering two new specialties to the telephone trade. One is Speed's special lightning arrester, which has many points of merit; the other is a telegraph learner's outfit, which is on entirely new lines. Mr. Speed invites correspondence and will gladly send printed matter and prices on application.

THE ECCLESTON LUMBER COMPANY, 29 Broadway, New York city, announces that it has now on hand a large stock of yellow pine cross-arms. The company is the manufacturer of and wholesale dealer in all kinds of poles, cross-arms, pins, brackets and railroad ties, timber and piling. The stock yard is at the foot of Forty-second street, Brooklyn, N. Y. The Eccleston Lumber Company is issuing a specification and price list, giving a quick reference to the quality and sizes of material which it has ready for immediate shipment.

THE CALCULAGRAPH COMPANY has issued a little card for keeping accurate track of the regulation of the Calculagraph. This is arranged so that an entry is made on the card as to whether the Calculagraph runs fast or slow and as to the extent and affords a means for keeping tab so that the Calculagraph may be regulated exactly. Incidentally, the card is a good thing for a man to have who wishes to regulate his watch and know that it is running properly. The card, of course, merely affords an opportunity for making

an entry of the variation of a watch so that the variation may be carefully noted.

THE CHICAGO TELEPHONE SUPPLY COMPANY, Elkhart, Ind., has recently sent to telephone men a large mailing card marked "a timely suggestion." On the reverse side is displayed the following: "A Chicago 1904 telephone is as indestructible as a plow, as finely finished as a piano, and as carefully made as a watch." The company invites correspondence and will send catalogues and prices upon request.

THE MILLER ANCHOR COMPANY, Norwalk, Ohio, reports an ever increasing demand for the Miller anchor. This anchor has been on the market for a little less than a year, but has met with such favor that many telephone engineers specify Miller anchors when building telephone properties. The anchor is exhibited at all conventions and recent sales have been large. The company will send full information and prices upon request.

SIMPLEX ELECTRICAL COMPANY, Chicago and Boston, has recently published a colored 1904 war map of Japan, Korea and Eastern China. This map is comprehensive and is invaluable to anyone who is following the newspaper accounts of the Japan-Russian war. The map will be sent free to those mentioning TELEPHONY. Address Simplex Electrical Company, Monadnock Block, Chicago, or 110 State street, Boston, Mass.

THE EUREKA ELECTRIC COMPANY, Chicago and Genoa, Ill., is now prepared to furnish its new Bell style self-restoring ring-down switchboard on which it has been favored with many orders recently. This drop has met with universal favor with telephone engineers, and is a new departure from the regular restoring drops. Its new bulletin on this new board is now ready and the company will be glad to mail it upon request.

THE SWEDISH AMERICAN TELEPHONE COMPANY, as usual, was in evidence at the Cincinnati convention. This progressive company was represented by its president, E. B. Overshiner, and C. H. Macklin and J. A. Russell, and its exhibit was one of the most attractive one at the convention. Judging from the crowd that was in constant attendance in its exhibit room it is reasonable to suppose that the company secured its share of the business.

BURIEL EXPENSES is the rather fitting title of a leaflet published by W. N. Matthews & Brother, Carleton building, St. Louis, Mo. The leaflet shows illustrations of the Stombaugh guy anchor, with price lists and a cut of the corkscrew button which will be sent to any address free. The wearing of this button is the only initiation needed to become a member of the Cork Screw Club. Every live telephone man should get a copy of the little leaflet "Buriel Expenses."

THE S. H. COUCH COMPANY, 156 Pearl street, Boston, Mass., has issued a four-page circular, describing its "Workwell" Telephone. These telephones are put on the market at very moderate expense and the illustrations portray a good-looking pair of instruments. Included in the circular are the specifications of the instrument making good reading for people desiring telephones for communication between house and stable, or between office and shipping room, or between any two points.

THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, Rochester and Chicago, has recently issued a folder on "Cables." A halftone view of the company's extensive factory at Rochester is shown, as well as samples of dry core lead covered cable in color. The company manufactures single, double and special wrapped cables, any number of pairs, from 1 to 500, or any thickness, sheath capacity or size of conductor. Satisfaction guaranteed. The company invites correspondence.

THE SWEDISH AMERICAN TELEPHONE COMPANY reports that it has contracts with the following concerns for their complete telephone equipment: Home Telephone Company, Scotland, Ind.; Farmers' Mutual Telephone Company, New Bavaria, Ohio; Severance Farmers' Mutual Telephone Company, Severance, Kansas; Graettinger Home Telephone Company, Graettinger, Ia.; Craig Telephone Company, Stockton, Mo.; Farmers' Mutual Telephone Company, Columbia City, Ind.

THE STANDARD TELEPHONE AND ELECTRIC COMPANY, Madison, Wis., is sending out a very difficult puzzle, which is easy when you know how. This puzzle will be sent to anyone interested. If you can solve it, and advise the company you will receive the complete line of literature illustrating and describing Standard apparatus. The Standard company is the oldest Independent telephone manufacturing concern in the United States and "Standard" apparatus has stood the test of time. Correspondence is solicited.

THE NATIONAL CARBON COMPANY, Cleveland, Ohio, which closed its fiscal year January 31, has now completed the fifth year of its existence. The company has earned and paid dividends on the preferred stock at the rate of 7 per cent. If the company follows precedent it is expected to charge off about $300,000 for depreciation. Up to the last statement January 31, 1903, the company had charged off more than $900,000 since its inception, while the profit and loss surplus, according to the last statement, was only $156,000.

ELECTRIC APPLIANCE COMPANY, Chicago, will send free on request, a transmitter calendar which is one of the most unique of its kind printed. The calendar has six months' dates on each side. It is only necessary to unscrew the mouthpiece from your telephone, put calendar on and screw mouthpiece in place again. In six months the calendar should be reversed. This is a distinct novelty and should be on every telephone. In writing to the Electric Appliance Company for one of these calendars, please mention TELEPHONY.

THE WESCO SUPPLY COMPANY, St. Louis, Mo., has just gotten out a new telephone and house goods catalogue, No. 60, which is a very complete and attractive book. The price list and discount sheet covering same is fastened inside the back cover, making it one of the handiest and most useful telephone catalogues ever issued. The house goods shown in this book covers an up-to-date line of annunciators, bells and electrical novelties, which makes a very interesting addition to the telephone apparatus and supplies listed therein. It can be had for the asking.

THE AUTOMATIC ELECTRIC COMPANY, Chicago, has recently sold a complete equipment for 1,000 stations to the Auburn Telephone Company, Auburn, N. Y. The company has also received an order for 800 stations for the Ideal Construction Company, Hopkinsville, Ky. These figures are for present installation, and the ultimate capacity for each exchange will be 10,000 stations. About seven years ago the Auburn company installed an automatic board with an ultimate capacity of 400 stations. This was soon filled, and in order to increase the list of subscribers, two manual boards of two operators' positions were purchased and connected with the automatic switchboard by means of trunk lines. The new automatic equipment recently sold to the company replaces the old automatic board and the two man-

ual boards which had been giving service in conjunction with it.

THE AMERICAN CONDUIT MANUFACTURING COMPANY announces that its main office has been moved from New Kensington to Pittsburg, Pa. The better facilities for communication thus obtained will enable the company to render better service to its patrons than before. The company invites all interested in conduit work to call on it at its new quarters. New improvements completed at the New Kensington factory, the company states, has enhanced the superior qualities of American conduit. The new office address is 413 Grant street, Pittsburg.

THE CENTRAL ELECTRIC COMPANY, Chicago, is sending out a circular which quotes some very attractive prices on American Circular Loom flexible conduit, for which it is sales agent. The company especially requests that any one who is in the market for this class of material should write for quotations. Attention is also called to the fact that the Central Electric Company is sales agent for Edison primary batteries, formerly known as Edison-Lalande batteries. The company carries a complete stock of these batteries and is prepared at all times to make prompt delivery.

THE H. W. JONES-MANVILLE COMPANY, New York city, N. Y., has placed on the market a fireproof material called "Niagrite," which is furnished in strips from three to thirty-six inches wide, suitable for wrapping spirally on electrical cables, and is held in place with asbestos fireproof glue, thus protecting the cable from external fire and confining any internal fire. The material presents a neat and permanent finish and, it is said, is not affected by atmospheric conditions. Full particulars may be obtained by addressing the asbestos department of the company.

COLUMBIAN ELECTRICAL COMPANY, St. Joseph, Mo., has just issued a very complete and comprehensive catalogue showing the company's complete line of telephones, switchboards, line and construction material, tools and appliances. The catalogue is considerably over one hundred pages and is fully illustrated with every practical apparatus or device necessary to the construction of a complete telephone exchange. The company invites correspondence from prospective buyers and will send its catalogue and lowest prices upon request.

THE MCROY CLAY WORKS desires to inform its customers, and the conduit trade in general, that it is prepared to fill orders for conduits this season promptly, having now upon its yards a large supply of the various multiples, and with its new equipment and large additions to its works, the output will be double that of previous seasons. Its usual high standard of manufacture will be maintained and its prices the lowest where quality is desired. The company states that the multiple duct is laid at less cost per foot than any "single" is not questioned by those who have laid both.

THE MONARCH TELEPHONE MFG. CO., Chicago, Ill., has recently added another novel and practical device to its telephone. This device is in the form of a damper, which is operated by the hook switch in such a way as to throw a leather disc on the inside of each gong as soon as the receiver is removed and the hook goes up. The company is now equipping all of its compact telephones with this device and probably all telephone men, as well as telephone patrons, will appreciate it, as the annoyance from the continued vibration of the gongs is entirely eliminated. This company has recently placed a new desk stand upon the market, which is very simple in construction and positive in operation. The hook switch is mounted conveniently in the base and all connections and spring contacts are easily accessible by removing the sheet iron bottom. A catalogue giving full descriptions of these features will be sent upon application.

THE FARR TELEPHONE AND CONSTRUCTION SUPPLY COMPANY, Chicago, has just issued "Circular Number One," which is the first of a series of circulars for 1904. This one pertains to transmitters, receivers, magneto bells, extension bells, ringer coils, and telephones and switchboards. The frontispiece of the circular is a half-tone of the Farr solid back transmitter number 4. Most of the contents describe telephones that talk far, ring far and are made and sold by Farr. The circular is unique in many ways, highly interesting, fully illustrated and will be sent to any address free, if this publication is named.

THE DEAN ELECTRIC COMPANY'S new factory at Elyria, Ohio, is being erected in record-breaking time. Seventy-five men are working on the building, which will be completed in about four weeks. It will be a modern factory in every particular. The company expects to have telephones ready for the market in less than sixty days, and other apparatus will follow until a complete line of modern telephone equipment will be offered Independent buyers. The company's general manager, A. E. Barker, may be relied on to secure sufficient orders to keep the Dean factory running night and day.

THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, Rochester, N. Y., and Chicago, Ill., is mailing an attractive folder describing and illustrating the semi-portable telephone for steam, electric and interurban railways. The folder is illustrated and the apparatus is described in detail. A reprint from the *Street Railway Journal* calls attention to S-C portable telephones and points out advantages and features of merit. The company has recently issued a folder describing a five-line switching telephone, which should be read by all telephone managers. These two folders are well worth sending for, and will be mailed by the company free upon request.

THE NATIONAL CONDUIT AND CABLE COMPANY, Times building, New York city, manufacturer of bare copper wire, weatherproof wires and cables, lead-covered wires and cables, in its "Copper Gossip" states that the general business outlook gives evidence of some improvement, and the various branches of industry seem to be gradually working around to more normal and satisfactory conditions. Active buying for Europe and heavy exports give the market for copper a firmer tone. There is also quoted the condition of the London copper market, comparison of New York and London prices, exports of copper for 1903, imports of copper for 1903, copper mining notes and development, and European copper statistics.

CROSS ARM TALK is the title of a little folder issued by the Frost Cross Arm and Lumber Manufacturing Company of Cleveland, Ohio, and Aberdeen, N. C., from which we quote the following:

"The difference in the first cost of a cross arm of poor quality, and one of the highest grade, is only a few cents per arm. A poor arm must come down within a year or two. A good one will last as long as the poles.

"Lightness and strength are of first importance in cross arms. There is nothing that fills all requirements like Southern yellow pine. It is but little heavier and is forty per cent stronger than Northern pine.

"As our mills are located in the heart of the Southern pine lumber region we have unexcelled facilities for getting the best quality of this timber for cross arm manufacture. Scattered through this district we have about thirty saw-

mills under contract to send us only the choicest of their cut."

THE NEW YORK OFFICES of the National Wire Corporation have been removed to Room 1103, Engineering Bldg., 114 Liberty street, with Richard C. Smith as New York sales agent, who states: "We shall be pleased to receive all inquiries at our new office and will be prepared at all times to furnish information or to make quotations when desired. Our New Haven mills are now in full operation, producing a large variety of wire products, including wire rope, galvanized telephone and telegraph wire, wire strand, tinned and coppered market wire, bright and annealed market and stone wire, bright and coppered screw stock, tinned mattress wire, black, coppered and liquor drawn spiring wire, and a great variety of special and miscellaneous wires for the jobbing and manufacturing trade."

THE LIST of small exchange switchboard shipments which follow cover shipments made by the American Electric Telephone Company, Chicago, during the past month, and embraces only a small exchange type of equipment: Nebraska City, Nebraska, one 25 line Express; Monroe, South Dakota, one 100 line Express; Senaloa, Mexico, one 25 line Express; Wheeler, Indiana, one 100 line Express; North Platte, Nebraska, one 100 line Express; Richmond, Missouri, one 50 line Express; Okeena, Oklahoma Territory, one 200 line Express; Garden City, Kansas, one 200 line Express; Maryville, Ohio, One 100 line Express; Urbana, Ohio, one 100 line Express; Wauseon, Ohio, one 100 line Express; Neodesha, Kansas, one 100 line Express; Hotchkiss, Colorado, one 100 line Express; Plainsboro, New Jersey, one 60 line Express; Pittsburg, Pennsylvania, one 10 line Express; Topeka, Kansas, one 200 line Express; Holden, Missouri, one 200 line Express.

THE INDEPENDENT CONSTRUCTION COMPANY, with offices at Archbold, Ohio, and Kankakee, Illinois, is one of the most progressive and modern construction companies in the Independent telephone field. Among the more prominent systems built by this company during the past six years might be mentioned the system for the Archbold Telephone Company and The Fayett Home Telephone Company of Fulton county, Ohio; The Antwerp Home Telephone Company system of Paulding county, Ohio; The Versailles Telephone Company's system, now merged into the Greenville Home Telephone Company's system of Dark county, Ohio; The Covington Home Telephone Company and The Pleasant Hill Telephone Company's systems of Miami county, Ohio; the system of the Harrison County Telephone Company of Harrison county, Ohio, which includes the plants at Cadiz, Jewett and Scio, and the system of the Union City Telephone Company of Randolph county, Indiana, also the Western Ohio Toll Line Company's toll lines and toll lines for the Eastern Indiana Toll Line Company of Winchester, Indiana.

The company is now actively engaged building the cities and towns as well as toll and farmer lines in Kankakee county, Illinois, which will cover the entire county, as well as nearby counties with the system of the Eastern Illinois Independent Telephone Company.

CHICAGO BELL-TYPE express switchboard, manufactured by the Chicago Telephone Supply Company, Elkhart, Indiana, recently have been installed in the following list of towns: Rulo, Lawrence, Howe, Filley, Beaver Crossing, Deshler, Milford, Davenport, Maxwell, Guide Rock, Sutton, Arlington, Danbury, Hyannis, Cody and Arnold, Nebraska; Sardisville, Port Clinton and Clyde, Ohio; Vermillion, Saybrook, Harvel, St. James, Ashkum, Waynesville, Rinard, Clinton, Kell, Astoria, Milford, Wyoming, Woodlawn, Wing, Dubois, Littleton, Smithshore, Lewiston and Findlay, Illinois; Bear Lake, Indiana; Knoxdale, Pa.; Fairview, Utah; North Liberty, Klondike, Bristol, Rockfield, Princeton and Crawfordsville, Ind.; Center Junction, Kirkman, Webster, Garnavillo, Grant, Floyd, Lewis, Klemme and West Grove, Iowa; De Funiak Springs, Florida; Zumbrota and Swanville, Minn.; Nome, Alaska; Headland, Ala.; Roche Harbor, Rosalie, Fredonia and Oakesdale, Wash, Harlan, Ky.; Kaw City and Custer City, Oklahoma Ter.; Parkman and Dayton, Wyoming; Hampton, S. C.; Lindsay, La.; Worsham, Va.; Bartlett, Republic and Meade, Kansas; Port Gibson, New York; Rosemont, Ontario; Mexican Central R. R.; Loganville and Antigo, Wis.; Dardenelle, Ark.; Mt. Vernon, Shell City, Warren and Walnut Grove, Mo.; Williamston and Lewiston, Mich.; Guymas and Hermosille, Mexico; Paulo, Brazil.

THE LEEDS & NORTHRUP COMPANY, 259 North Broad street, Philadelphia, Pa., has published a complete set of catalogues descriptive of electrical testing instruments. The general catalogue, descriptive of electrical testing instruments, covers apparently everything necessary for first-class work in this line, and shows not only photographic reproductions, but essential connections, and accurately describes the use of the apparatus. Catalogue No. 4 describes standard resistances. The company has given a great deal of attention to this line of material, and the catalogue is full of good reading on this subject. Catalogue No. 380 describes portable testing sets and cable-testing apparatus. Catalogue No. 7 describes a new line of high-grade keys for electrical testing, and gives some valuable information upon the subject of contacts and joints. The Carey-Foster bridge, for accurate comparison of resistances, is described in catalogue No. 9. This apparatus is used in the company's own laboratory for all high-resistance measurements. Catalogue No. 3 describes moving-coil galvanometers. In this catalogue is taken up the wall D'Arsonval galvanometer, type H, which is a splendid instrument for general laboratory work. Catalogue No. 1 describes resistance boxes and Wheatstone bridges, and gives a number of very valuable hints as to manipulation of connections for various ratios. Catalogue No. 2 describes the standard potentiometer. This is the chief specialty of the Leeds & Northrup Company, and is guaranteed to be a remarkable instrument in every way. Catalogue No. 8 is descriptive of self-induction apparatus. This is not a new line, but the material is of great value in laboratory practice.

THE ANNUAL MEETING of the stockholders of the Standard Underground Cable Company was held at the general offices of the company in the Westinghouse Building, Pittsburg, Pa., on January 26, 1904. The statement was presented, showing that the company did a gross business of nearly $9,000,000 during the year 1903, and that dividends were paid on its capital stock aggregating twelve per cent; and that the company's assets aggregate the handsome sum of $3,604,457.00 with only $375,344.00 of liabilities, apart from capital stock. It has no outstanding notes, mortgages, bonds, or preferred stock. The board of directors elected for the ensuing year are: Mark W. Watson, John B. Jackson, James H. Willock, Robert Pitcairn, J. N. Davidson, John Moorhead, B. F. Jones, Jr., Joseph W. Marsh and W. A. Conner. The only change in the board is represented by the election of W. A. Conner, who has been at the head of the manufacturing department of the company since 1884. The meeting of the board of directors for purpose of organization was held on the 29th inst., and the former officers were re-elected as follows: Mark W. Watson, president; Joseph W. Marsh, vice-president and general manager; Frank A. Rhinehart, treasurer, and C. M. Hagen, auditor. This company was the pioneer in the manufacture of underground cables for all classes of electric service, having been formally organized in January, 1882. Although much

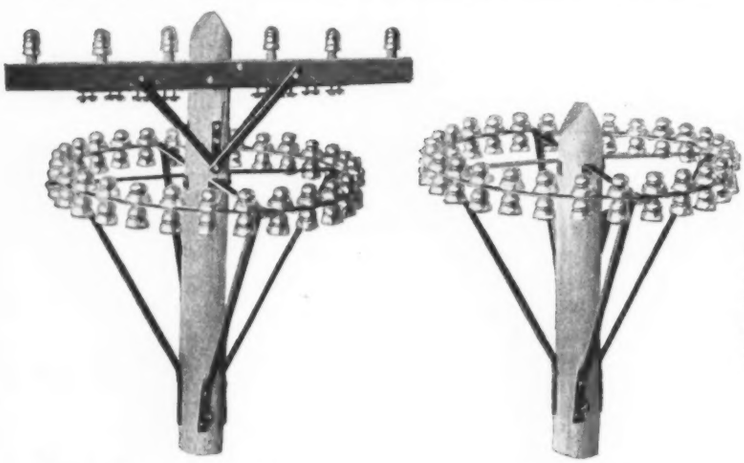
experimental work has been done by Richard S. Waring, the founder of the company, prior to its organization, its reputation for high-class manufacture in each of its departments, comprising bare copper wire, weatherproof wires and cables, rubber insulated wires and cables, and both paper and rubber insulated lead covered cables for telephone, telegraph, electric light and power service, together with the favorable location of its factories—Perth Amboy, N. J.; Pittsburg, Pa., and Oakland, Cal., and its strong financial condition, place it in a most favorable position to command a large business in its various lines.

BISSELL POLE DISTRIBUTORS.

The F. Bissell Company, Toledo, O., reports a large demand with the spring trade for its new pole distributing ring, which we are privileged to illustrate herewith.

Although not a new method of pole distribution, the design here shown has a number of distinct advantages. Any circular ring affords better connection for radiating lines than may be obtained with the old style cross arms, but not all rings are substantial nor convenient. The trouble with earlier rings has been the lack of insulation. This ring is provided with glass insulators set on wooden pins. The iron bolt which passes through the wooden pin does not touch the glass nor does the glass touch the iron ring.

Usually rings are made to fasten only on the top of the pole; but this new ring will go on the top or any point below it. Most designs bore holes at right angles through the pole. These must, necessarily, be big enough to pass strong supporting bars, and the removal of so much wood weakens the pole to the danger point. This design is held by braces which come against the pole and are fastened



by ordinary lags, ½x4, which remove no wood and leave the pole as strong as before.

The rings themselves are split and may be passed around the pole below the cross arms or between them. The varying diameters of different poles and of the same pole at different heights are provided for. The horizontal braces are slotted, through which pass the bolts which attach them to the ring. This permits these braces to slide in or out, adapting themselves to the fixed diameter of the ring and the varying diameters of the pole and the completed job rests firmly without internal strain.

The internal diameter is 48½ inches, which allows for the pole, yet leaves enough room for a man to easily climb through it. The crotch between the pole and the slanting braces can be used as a step, or the regular wooden or iron pole steps may be provided, or a platform.

The strength of the rim is ample, being made of iron ¼x2, laid flat, which presents the edge against the strain. It is supported by four horizontal and four slanting braces, which are fastened to the pole by lag screws ½x4.

The insulators are 56 in number, and of standard two-piece transposition type, so are easily replaced if broken. Their center is 5.7 inches, and the space between the edges, 2.0 inches. This is room enough to prevent the contact of radiating wires.

Each insulator may be used for duplex wires, or for single conductor, as preferred. In addition to their many good qualities, these rings are cheap. The manufacturers pack the braces in a box with the insulators and pins, bolts and lags complete, and a foreman can start a gang with one ring and one box and have everything. The annoyance of a requisition on the stock clerk for minor parts is saved.

AMERICAN PROTECTORS.

The American Electric Fuse Company, Chicago, has been meeting with marked success in the sale of its new protectors. Of the many letters of commendations received the following two are selected to give an idea of the opinion held of American protectors:

ALMA, MICH., January 30, 1904.

American Electric Fuse Company, Chicago, Ill.

Gentlemen: Since installing your switchboard protector I have given it careful and strenuous tests, and do not hesitate to say that it meets the requirements in all particulars.—W. B. SERVISS, Supt. Union Telephone Company.

HOLLAND, MICH., January 24, 1904.

American Electric Fuse Company, Chicago, Ill.

Gentlemen: Having given your rack and protectors a test of over a year, under varying conditions, I am pleased to say they have given entire satisfaction.—W. H. ORR, Local Manager Citizens' Telephone Company.

TREATISE ON WOOD PRESERVATION.

To those who are interested in the preservation of wood we recommend a book recently published by the International Creosoting and Construction Company of Galveston, Texas, entitled "Treatise on Wood Preservation," which is one of the most complete treatises of its kind we have seen. The illustrations are many and interesting and show views of an industry, which to most people is new. The company will send the book prepaid to any address upon request, and we promise that anyone who will look over its hundred pages of reading matter and illustrations will be amply repaid for the trouble.

S. E. CO. RECEIVER.

In offering the S. E. Co. receiver (see illustration in advertisement), the Spies Electric Company, Chicago, feels confident that it has several particularly good and valuable features in addition to the general workmanship, which like all "Spies" products is of unusual merit, and on a par with that of the foremost manufacturers of the day.

Referring to the particular features of the S. E. Co., simplicity of detail and effectiveness of the cumulation of the constituent parts as a whole is of course the salient feature; yet the little details, which like the works of a watch, determine its value, have had most careful consideration.

For example: The adjustment is perfect. With a slight relaxation of a screw, as readily accessible as is your lead pencil, the metal cup containing the coils is released, and may be turned so as to raise or lower the poles of the magnet in whatever direction adjustment is required. Resetting this screw clamps it positively to stay adjusted, and neither jar or fall can effect the adjustment, thus combining the good points of an adjustable instrument with that of one of the solid or non-adjustable type. The metal cup may also be entirely removed, leaving all other parts in-

tact, and with the cup removed, the coils stand free and open to inspection.

The entire internal mechanism is self-contained, and a change of shell is permissible without interference with the internal parts or the adjustment. All parts are assembled and fitted together in a mechanical, workmanlike manner, insuring permanency and effectiveness.

It is of pertinent interest to any and all buyers of the important adjunct of the telephone to become familiar with the S. E. Co. receiver and the Spies Electric Co. invites correspondence and will quote prices on application.

THE DEFECTS OF THE MULTIPLE EXCHANGE.

Here is an inquiry which shows that a little direct discussion will be of advantage to many Independent telephone people:

"We are to get our franchise amended so that we may raise our rates. It is the experience of all telephone companies that it costs more to operate a large exchange than a small one but it is hard to make people believe it. Do you know of any magazine articles covering that point or any other literature bearing on it? If so please send it to us."

If this correspondent had carefully read TELEPHONY, and especially the later numbers thereof, he would have been quite fully informed. This question is one which has so bothered people who have not had the time to ponder over the more or less obscure explanations that have been made by most of the experts, up to a short time ago, that it is not wonderful that it is approached by the busy man with reluctance.

Besides it has mainly been because of the discussions about manual and automatic exchanges that some real knowledge has been gained. No fair discussion of the matter can be had which does not compare the two systems.

Right here I say that the great change cannot come in a day; and so every one who is fair-minded will read what follows herein always keeping in mind that I am pleading for a standard.

I am keeping my invention to guard and protect the smaller Independent companies, while the great change is inevitably coming.

The Independent manual exchange manufacturer will have much business for a long time, and for the reason that the great change cannot be made at once. Now to the subject in hand.

In the January, 1904, number of TELEPHONY, at page 69, Mr. C. J. H. Woodbury says:

"A telephone switchboard is an exception to general forms of construction in that the cost per unit increases at a greater rate than the enlargement, and this is due to the fact that, as the operator who receives a call from a subscriber must be able to reach the terminals leading from the switchboard to any other telephone or to the switchboards at other stations, and therefore each set of telephone wires must have as many sockets and branches as there are operators' sections at the switchboard.

"For example, in small switchboard with two operators' sections, there would be two sets of such branches and sockets for each telephone line, while in a large switchboard with fifty operators' sections, there would be fifty sets of such connections for each telephone line instead of two sets mentioned in the first instance, the number of this class of connections multiplying twenty-five times for each telephone.

"This increase of complication of detail growing upon itself would reach a prohibitive cost in large cities had it not been found feasible to depart from the original plan of one central telephone station in each city and to introduce a modification by apportioning large cities into telephone districts, each with its telephone station connected to the others by numerous trunk wires. * * *

"The mechanical intricacy of the modern switchboard may be well appreciated by the fact that, even with present methods of special machinery and the organized application of skilled artisanship, it requires as long to make and install a switchboard as it does to build and equip a merchantman, the time being from one to over two years, and the cost of the central station plant may reach $1,200 per foot of length for the larger switchboards, and perhaps half that cost per foot for a switchboard adequate for a city of 50,000 inhabitants. * * *

"When a switchboard is started in the service the elements of its active demolition begin; repairs and adjustments are necessary, extensions become needed for increased capacity, wear and tear has been outclassed by the more iconoclastic depreciation from subsequent invention, and in a few years the old board becomes obsolete and the expensive apparatus is burned for the intrinsic value of the copper which it contains."

All this being true one must look to "subsequent inventions" for a remedy.

In one of the first circulars put out by the Faller Automatic Telephone Operator Company it is very truthfully said:

"* * * It is necessary, in a multiple board, when putting in connections for new subscribers, to repeat the connection once for each section already in service.

"Thus, to put 200 new subscribers into an exchange having 10,000 circuits already installed, each new subscriber's connection would have to be put in fifty times, that is once in each of the existing sections; there being generally fifty sections in a multiple exchange of this size; while with the Faller system each new subscriber would have to be connected once only."

Mr. W. J. Hammer (in a paper read before the American Institute of Electrical Engineers on the "Faller," January 23, 1903, and published in TELEPHONY March, 1903) says:

"The cost of construction where the multiple section system is employed is enormous. It is a fact well understood by experienced telephone men that, as the number of the subscribers which are connected to any exchange (whether manual or automatic), increases, the expense, both of operation and maintenance increases in far greater proportion than the increase in the number of subscribers. This is not the case, however, with this (Faller) automatic system, which, as regards the central exchange expenses and construction expenses and maintenance charges, increases more nearly in a direct proportion with the increase in the number of subscribers.

"The length of reach of the human operator in the manual exchange is very limited. She is generally expected to cover a section of board 30 inches each side of her. This is not the case with this mechanical operator, the range of which is practically unlimited. Furthermore, in the latter case, the machine is not delayed by connecting and disconnecting, as it can connect and disconnect at one and the same time, a function which is not possible with the human operator." * * *

"This mechanical operator has been designed and constructed upon the following lines: i. e., an absolutely reliable, prompt, rapid and uniform service in telephone exchanges of any size; an embodiment of all essential features demanded by the exigencies of modern telephone practice; an elimination of the unreliable, flimsy and complex features inherent in systems heretofore presented to the public; and finally, the effecting of large economics in construction and maintenance charges."

In 1897 when I first saw a section of the "Strowger" Automatic Exchange (at Princeton) it seemed very certain that the automatic would displace the manual. *It also then seemed necessary and certain that a central energy automatic operator must be the culmination of the movement.* When I first saw the description of the "Faller Mechanical Operator" I knew that all forms of multiple exchanges were doomed. In March, 1902, I declared for the "Faller." Afterwards I saw a section of it and now think well of both the machine and the people who own it, and shall so continue until I have reason to think otherwise. (See my paper entitled "The Issue Between the Automatic and the Manual" in October TELEPHONY.)

See Mr. M. A. Edson's fine paper entitled "Efficiency of Modern Telephone Equipment," page 76 of January TELEPHONY:

"TABLE OF TELEPHONE PLANT EFFICIENCIES.

	Per cent. Manual System.	Per cent. Automatic System.
Lines—local battery	95	95
Lines—central energy	90	..
Switching mechanism—local battery	90	90
Switching mechanism—central energy	50	..
Subscribers' equipment—local battery	25	25
*Subscribers' equipment—central energy	15	..
Operators or operating	30	90
Power plant	50	50

Net plant efficiency—local battery, 3.2 per cent.
Net plant efficiency—central energy, .9 per cent.
Net plant efficiency—automatic local battery, 9.6 per cent.

"The power plant efficiency will increase slightly with the size

of the exchange, but it is assumed to just supply the ultimate equipment of the plant.

"In the local battery systems the power plant decreases in size at the central office, but the number of local batteries increases in direct ratio to the number of subscribers. The efficiency for good service is 50 per cent of the available energy in the local battery.

"*The central energy subscribers' equipment shows a low efficiency on account of the inability of the transmitter, local induction coil and condenser to transform the comparatively low tension primary direct current into high tension alternating or undulating current."

This last paragraph shows that Mr. Edson realizes that *the transmitter, the local induction coil and the condenser are transforming devices.* He will appreciate the great change proposed by me when I say that, at West Union, I shall operate the "Faller (central energy) Mechanical Automatic Operator" directly from a high frequency alternating dynamo and also operate the speaking circuit directly from the dynamo without coils or condensers in such circuit. The farmers' transmitters, receivers and underground lines (indicated on the map shown in my advertisement in this and in the February numbers of TELEPHONY, which deals with the rural delivery and rural telephone question at West Union, Clermont and Elgin in Fayette County, Iowa) will be so operated. *So we shall operate the iron wire grounded circuits of the farmers' long distance lines.* This declaration is made as a matter of record and not as a description of or publication of the method or invention. Mr. Edson continues the subject:

In calculating the efficiency of the various auxiliary devices, such as induction coils, repeating coils, relays and retardation coils, the losses have been measured on the same basis as modern power transmission transformers—viz., iron loss, copper loss and the ratio of transformation for various frequencies within the range of the human voice. A point remains for future work to ascertain the effect of wave form on the apparatus, but investigation is now under way with special telephonic osciligraphs and valuable engineering data is being collected.

The telephone industry has passed through three periods of evolution. The apparatus used in the eighties—magnet, series and Blake transmitters; the period of the nineties—bridging, multiple, all carbon transmitters, metallic lines, etc.; the period of 1900—central energy, automatic signals and still better lines. Are we not now entering on a fourth period of automatic central energy, with high hopes of increasing the all too small efficiency of modern telephone equipment?

Mr. Edson might have said (and it is very strange that so keen and intelligent a writer did not say) that the "Faller" is fully occupying this fourth period of automatic central energy telephony and has increased the all too small efficiency of modern telephone equipment.

In which case Mr. Edson would have had a separate column for the "Faller," and in the spaces for the central energy items would have put figures representing high efficiency.

So it is seen that the only question is not whether the manual or the automatic is the best, but which automatic is the best.

If one should compare all automatics even with reference to these points, viz., central energy, connection per given number of telephones, switching machines per given number of telephones, relays per given number of telephones, stationary batteries per given number of telephone, then an intelligent answer could be given.

It is certain that our correspondent must give over the idea of raising rates in order to keep the manual multiple exchange.

In the Des Moines Register and Leader of January 12, 1904, there was a report of the annual meeting of the stockholders of the Des Moines Mutual Telephone Company. The following statement appeared:

"The remainder of the session was devoted to discussing the merits of the automatic system. Many were highly in favor of it, while others were opposed. The automatic system will be more costly to install at present than the multiple switchboard, but, it is claimed, will be cheaper in the long run. Some questioned the success of the present patents in actual tests. One argument made in its favor is that if the automatic system is successful it will furnish the company a big leverage over the Bell company. If the multiple switchboard is put in, new quarters will have to be secured; while the present quarters will be ample if the automatic system is used."

Here the increasing cost of enlargement is observed.

OSCAR WENTWORTH ROGERS.

Chicago, Feb. 20, 1904.

NORTHERN ILLINOIS INDEPENDENTS MEET.

The Northern Illinois Independent Telephone Association, a district organization embracing most of the Independent companies in northern Illinois affiliated with the Inter-State Independent Telephone Association, recently held a convention at Aurora. Twenty-two delegates were in attendance and formed a temporary organization by electing A. B. Conklin temporary president, and R. H. Gibboney of Rockford secretary.

NEWARK TELEPHONE COMPANY REBUILDS.

The Newark (Ohio) Telephone Company has taken a new lease of life the past year, and the number of its subscribers has increased over one hundred per cent. This company was incorporated in February, 1895, and is therefore one of the oldest Independent plants in Ohio. It opened its exchange in April of that year with 200 subscribers, and the increase was very gradual until August 1, 1902, when it was decided to rebuild the entire plant. Accordingly, a contract was made with W. H. Crumb & Company of Chicago, Ill., to undertake the rebuilding of the outside construction, and the contract for a central energy switchboard and telephones was awarded to The Sterling Electric Company of Lafayette, Ind.

The first subscriber was connected up on January 5, 1903, at which time the total number of subscribers was six hundred. The growth of the company since that time has been very rapid, having averaged over fifty new subscribers per month, so that the company has now over 1,300 subscribers. It has been found necessary to increase the capital stock of the company to provide for this remarkable increase in business, and the cable capacity which it was found necessary to increase six months ago, is now very nearly filled up again, and still more cable will have to be added this spring. There is no plant in central Ohio to-day which has a brighter outlook than this one, while only eighteen months ago, it was in a very bad condition.

The following is a list of the directors of the company, being all business men of Newark: Harry Swisher, president; Charles Spencer, secretary; Edward Kibler, treasurer; John Brennan, vice-president; Warren Weiant, E. T. Rugg, J. J. D. McNamar. Charles E. Hollander is manager of the company.

THE PARTY LINE TELEPHONE.

Washington, Ohio, has thousands of party line telephones. The best of feeling does not always prevail between those on the party lines when both want to use the telephone at the same time, says the Rochester Democrat and Chronicle. A prominent politician is on a party line with a doctor. He was in great haste to get a friend over the telephone and began ringing and shouting "hello." The other subscriber wanted to use his telephone at the same time, with the result they were soon saying harsh things to each other.

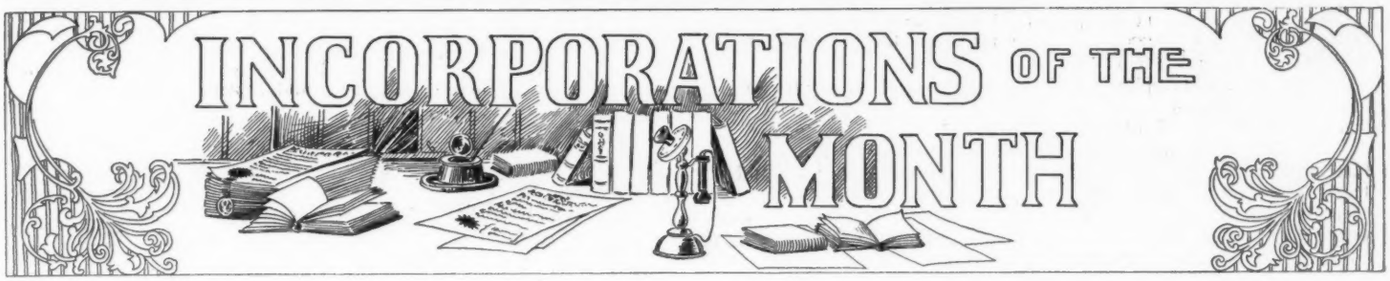
"Who are you?" demanded the politician.

"I'm Dr. Blank," was the answer.

"Oh, pardon me, doctor, you can have the line. If it weren't for you I couldn't make a living."

"Well, who are you?" asked the doctor.

"I'm Jones, the undertaker," was the answer.



Madison Telephone Company, Madison, Nebr.

Lake Shore Telephone Company, Mt. Auburn, Ia.

Pioneer Mutual Telephone Company, Brownsville, Ore.

Milton Telephone Company, Milton, N. Y. Capital $5,000.

Farmers' Mutual Telephone Company, Manson, Ia., organized.

Whig Center Telephone Company, Litchfield, Mich., organized.

Tripp Telephone Company, Tripp, S. D. Capital stock $2,000.

Sheakleyville Telephone Company, Seakleyville, Pa., organized.

Farmers' Mutual Telephone Company, Detroit, Kans., organized.

Farmers' Mutual Telephone Company, Antioch, Ind., organized.

Velpen Home Telephone Company, Velpen, Ind. Capital stock $500.

Western Wisconsin Independent Telephone Company, Sparta, Wis.

Norwich Telephone Company, Norwich, Kans. Capital stock $3,000.

Fall River Telephone Company, Fall River, Kans. Capital stock $3,000.

Tri-County Telephone Company, Bath, Minn. Capital stock $21,000.

Atwater Telephone Company, Atwater, Minn. Capital stock $10,000.

Home Telephone Company, Deadwood, S. D. Capital stock $50,000.

Pilot Mound Telephone Company, Pilot Mound, Ia. Capital stock $10,000.

Colman Electric Telephone Company, Colman, S. D. Capital stock $10,000.

Madison Mutual Telephone Company, Madison, N. Y. Capital stock $1,500.

Mt. Pleasant Telephone Company, Mt. Pleasant, Ohio. Capital stock $10,000.

Reading Central Telephone Company, Reading, Mich. Capital stock $10,000.

Rollag Telephone Company, Rollag, Minn., organized. Capital stock $25,000.

Northwestern Telephone Company, Wakefield, Nebr. Capital stock $100,000.

Egg Harbor City Telephone Company, Egg Harbor City, N. J. Capital stock $10,000.

Eastern Kansas Telephone Company, Kincaid, Kans., organized. R. T. Fraser, secretary.

Swift Run Telephone Company, Standardsville, Va. Capital stock $5,000. E. Dott, president.

Farmers' Mutual Telephone Company, Liberty Center, Ohio. Incorporators, J. E. Leist and others.

Farmers' West Crescent Telephone Company, Reardan, Wash. G. Garber, president; A. J. Cone, secretary.

Sutton Telephone Company, Sutton, Nebr. Capital stock $10,000. L. B. Stiner, secretary; James West, treasurer.

Oshkosh Construction Company, Oshkosh, Wis. Capital stock $10,000. Incorporators, E. A. Severson, W. K. Porter.

Phoenix Telephone Company, Ames, Okla. Capital stock $1,000. Incorporators, A. Mathis, B. F. Hogard, W. H. Mathis.

Kelsey Telephone Company, Kelsey, N. Y. Capital stock. Incorporators, Geo. Webster, J. H. Alexander, I. Huntington.

City Telephone Company, Turtle Lake, Wis. Capital stock $2,000. Incorporators, Frank E. Fisk, John Hogan, W. W. Fisk.

Northeastern Iowa Rural Telephone Company, Jewell, Iowa. Capital stock $1,000. Incorporators, J. R. Baker, L. H. Ayer, Jr.

Grafton Telephone Company, Grafton, Wis. Capital stock $4,000. Incorporators, John G. Buch, F. C. Mintzlaff, F. W. Mintzlaff.

Newkirk Telephone Company, Newkirk, Okla. Capital stock $5,000. Incorporators, H. H. Smock, J. H. Thompson, Gary Stovall.

Randleman Telephone Company, Randleman, N. C. Capital stock, $5,000. Incorporators, S. Bryant, T. F. Marshall, Jr., H. O. Barber.

Brunswick Independent Telephone Company, Brunswick, Ohio. Capital stock, $5,000. Incorporators, Dennis M. Johnson and others.

Oklahoma Rural Telephone Company, Enid, Okla. Capital stock $5,000. Incorporators, M. M. Davis, W. H. Hatch, G. W. Halliday.

Norborne Telephone Company, Norborne, Mo. Capital stock $5,000. Incorporators, N. P. Evans, Newlin Conklin, D. A. Mansure.

Pioneer Telephone Company, Brownsville, Oreg. Capital stock $4,000. Incorporators, Geo. A. McCart, W. W. Poland, C. F. Leatherman.

Good Service Telephone Company, Johnson City, Mo. Capital stock $2,500. Incorporators, J. E. Poindexter, D. R. Penson, Calvin Dillon.

Carthage and Coluca Telephone Company, Adrian, Ill. Capital stock, $2,500. Incorporators, William Block, J. L. Haines, William Busch.

Middletown Mutual Telephone Company, Middletown, Ill. Capital stock $2,500. Incorporators, J. C. Lloyd, P. J. England, Thomas Dorgan.

Murray and Lacelle Telephone Company, Osceola, Ia. Capital stock $450. Incorporators, George Coon, Jacob Reueder, E. D. Hamm.

Dunn County Telephone Company, Ridgeland, Wis. Capital stock $10,000. Incorporators, M. L. Randall, A. L. Pongratz, A. R. Fergus.

Washington County Telephone Company, Akron, Colo. Capital stock $5,000. Incorporators, H. W. Twombley, C. D. Pickett, M. H. Spere.

Mt. Olivet and Gold Telephone Company, Fairfield, Ia., organized. President, S. Baldwin; secretary, J. Sanford; treasurer, S. McKitrick.

Hamilton Mutual Telephone Company, Hamilton, Mich., organized. M. E. Hoadley, president; John Michmershuizen, secretary and treasurer.

Somerset Farmers' Co-operative Telephone Company, Norridgewock, Me., organized. President, Clarence Rogers; treasurer, C. L. Holbrook.

Independent Telephone Company, Odell, Nebr., organized. F. W. Stanosbeck, president; Arthur Williamson, secretary; J. E. Murphy, treasurer.

Farmers' Mutual Telephone Co., Chandler, Mo. Capital stock $750. Incorporators, S. S. Brown, G. W. Brown, H. P. Pomeroy, J. T. Nemeyer.

Tampico Farmers' Mutual Telephone Company, Tampico, Ill. Capital stock $4,900. Incorporators, W. M. Maloney, A. C. Hunter, E. B. Cummings.

Farmers' Mutual Telephone Company, Kirkham, Ia. Capital stock $20,000. Incorporators, R. Anderson, John McDowell, James Bristol and others.

Centerpoint Telephone Company, Centerpoint, Ind. Capital stock $5,000. Directors, H. F. Webber, P. L. Lansitt, M. H. Campbell, R. M. Bryant.

Laurel Fork Telephone Company, Laurel Fork, Va. Capital stock, $5,000. Incorporators, C. W. Anderson, C. C. Webb, James Largen and others.

Tampico Farmers' Mutual Telephone Company, Tampico, Ill. Capital stock $4,900. Incorporators, W. M. Maloney, A. C. Hunter, E. B. Cummings.

Northwest Quincy Rural Telephone Company, Quincy, Mich., organized. President, H. M. Noble; secretary, C. A. Boley; treasurer, M. D. Kanouse.

Abbotsford Electric Light and Telephone Company, Abbotsford, Wis. Capital stock, $25,000. Incorporators, A. J. Young, E. C. Schilling, G. H. Schilling.

Rural Telephone Company of Oaklandon, Oaklandon, Ind. Capital stock, $300. President, Alexander Mock; secretary, S. W. Combs; treasurer, W. F. Combs.

Prattsburg Overland Telephone Company, Prattsburg, N. Y. Capital stock $10,000. Dr. B. J. Scott, president; R. T. Conine, secretary and general manager.

Amazon Wireless Telegraph and Telephone Company, Augusta, Me. Capital stock $1,000,000. J. Berry, Augusta, president; L. A. Burleigh, Augusta, treasurer.

Yoker Valley Telephone Company, Quaker City, Ohio. Capital stock, $550. Incorporators, W. W. James, J. Wyscaner, N. P. Hartley, N. C. Long, H. D. Long.

Wilhelm Telephone Manufacturing Company, Buffalo, N. Y. Capital stock, $5,000. Incorporators, T. H. Meyers, W. H. Wilhelm, H. A. Brehn, Baltimore, Md.

Cynthiana Telephone Company, Cynthiana, Ind. Capital stock $3,000. Directors, Geo. Cannaday, W. J. Helms, George Burke, John Arnett, Dr. H. B. Smith.

Sharp County Telephone Company, Evening Shade, Ark. President, J. C. Wilson; vice-president, J. S. Medley; secretary, C. L. Coger; treasurer, W. B. Ham.

Kirtland Telephone Company, Kirtland, Ohio. Capital stock, $2,500. Incorporators, Arthur C. Tryon, Ida A. Harris, Henry Hooper, W. R. Crary, W. A. Criswell.

Prattsburg Overland Telephone Company, Prattsburg, N. Y. Capital stock $10,000. President, Dr. B. J. Scott; secretary and general manager, R. T. Conine.

Farmers' League and Community Telephone Association, Carbondale, Ill. Capital stock $2,500. Incorporators, James England, N. L. Wylie, R. H. Montgomery.

Farmers' League and Community Telephone Association, Carbondale, Ill. Capital stock $2,500. Incorporators, James England, N. L. Wylie, R. M. Montgomery.

Maumee Valley Telephone Company, Perrysburg, Ohio. Capital stock $15,000. Incorporators, N. L. Hanson, J. Davis, E. J. Blue, D. H. Hollenbeck, T. M. Franey.

Madison Mutual Telephone Company, Wolsville, N. Y. Capital stock $1,500. Directors, L. F. Bridge, A. H. Holland, George A. Lyon, H. L. Brooks, S. W. Peckham.

Telephone Hygenic Company, Cleveland, Ohio. Capital stock $100,000. Incorporators, H. H. Johnson, G. G. Whitcomb, F. B. Williams, T. H. Hogsett, G. H. Kelly.

Reinbeck Mutual Telephone Company, Reinbeck, Ia., organized. President, E. E. Green; vice-president, J. D. Morrison; secretary, H. A. Horstman; treasurer, John Wilson.

Farmers' Rural Telephone Company, Cassidy, Mo., organized. T. L. Hanks, president; E. S. Patterson, vice-president; Grant Gooch, secretary; J. T. Deeds, treasurer.

Valley Junction and Orilla Telephone Company, Valley Junction, Ia., organized. Capital stock, $900. President, R. J. Youtz; vice-president, C. H. Taskett; treasurer, Franzillo Clark.

Skagit Farmers' Telephone Company, Stanwood, Washington. Capital stock, $200,000. Incorporators, Charles A. Barron, Raymond F. Barron, Willis M. Barron, Rolland R. Land.

Denver Co-operative Telephone Company, Denver, Ind. Capital stock, $3,000. Incorporators, Ira L. Eckenberry, Sol D. Raber, Lando C. Dukes, Isaiah G. Brower, Samuel C. Kinzie.

Farmers' Mutual Telephone Company, Chariton, Ia. Capital stock $10,000. President, C. E. Conner; vice-president, L. Rex Bennett; secretary, C. G. Burr; treasurer, J. J. Riggs.

Tontogany Telephone Company, Tontogany, Ohio. Capital stock $10,000. Incorporators, Jacob Huffman, Charles C. Cummings, Henry W. Huebner, Benjamin F. James, Robt. C. Collins.

Beeghley Telephone Company, Weston, W. Va. Capital stock $50,000. Incorporators, Lloyd Beeghley, Hattie Beeghley, R. A. Beeghley, Weston; Mary A. Swisher, Charles Beeghley, Janelew, W. Va.

Independent Long Distance Telephone Company, Boise, Idaho. Capital stock $250,000. Directors, H. E. Neal, E. H. Beggs, A. J. Swain, Boise; James McDevitt, R. N. Shaw, Harry L. Fisher, C. J. Sineel, M. B. Zimmer.

Wright County Telephone Company, Waverly, Minn. Capital stock $50,000. Incorporators, William Quinn, A. C. Hefferon, C. E. Wright, Geo. W. Jennings, John Mooney, J. Holliday, G. S. Berker, J. F. McDonald, J. B. Quinn, Jr.

Ellsworth Mutual Telephone Company, Ellsworth, Ia. Capital stock $10,000. Incorporators, John A. Sparhoe, Holden Thompson, O. M. Lyders, B. Peterson, J. O. Anderson, D. Knudson, F. R. Dalbey, John P. Holt, H. M. Brinton.

ANNUAL MEETINGS.

DELAWARE.

DOVER—The Diamond State Telephone Company has elected the following officers and directors for the ensuing year: Harry A. Richardson, president; Dr. E. S. Anderson, vice-president; Dupont Walker, secretary and treasurer; W. H. Baker, general manager. J. D. Fooks, Richard R. Kenney, George M. Jones, A. B Richardson, Stephen Slaughter.

COLORADO.

DELTA—The Co-operative Telephone Company has elected the following officers: F. R. Rockwell, president; W. J. Hunt, vice-president; Dr. Follensbee, secretary and treasurer.

ILLINOIS.

SIBLEY—The Sibley Telephone Company has elected the following officers for the coming year: A. A. Absher, president; Otto Finkenscher, vice-president; W. A. Warner, secretary and manager; W. R. Hamilton, treasurer.

SYCAMORE—The DeKalb County Telephone Company has re-elected the following directors for the ensuing year: H. J. Stark, J. M. Joslyn, O. P. Herrick, S. C. Pike, G. M. Sivright, Elthom Rogers.

GALESBURG—The Galesburg Union Telephone Company has elected directors as follows: G. B. Churchill, Lafayette Weinberg, H. M. Chase, D. L. Peterson, Geo. L. Price, F. N. Granville, Nels M. Burgland, I. S. Callender, W. N. Phillips, W. E. Terry, B. F. Brown.

OSCO—The Osco Telephone Company has elected officers as follows for the ensuing year: R. E. McGaughey, president; Mort Wilson, secretary; M. V. Lawyer, treasurer.

ROCK ISLAND—The Union Telephone Company has re-elected the following officers for the ensuing year: N. Hamilton, president; C. A. Lee, secretary; John W. Morrison, treasurer; F. P. Walch, cashier.

INDIANA.

SALINE CITY—The Farmers' Independent Telephone Company has elected the following officers: Ernest Fish, president; F. A. Foulke, vice-president; L. Somers, treasurer; R. E. Barnhart, secretary.

MONROE CITY—The Wabash Telephone Company has elected officers for the ensuing year as follows: E. S. Von Tress, president; Dr. James M. Goldman, vice-president; E. P. Blann, secretary; James Bonewits, treasurer; F. M. Goodsell, manager.

WABASH—The stockholders of the Home Telephone Company have elected the following officers for the ensuing year: Dr. R. F. Blount, president; N. G. Hunter, vice-president; W. S. Stitt, secretary; John Hipskind, treasurer; Wilder Kondell, manager.

MUNCIE—The Delaware and Madison Counties Telephone Company has elected the following officers for the ensuing year: A. L. Johnson, president; J. J. Netterville, vice-president; Thomas Bromley, secretary; J. C. Johnson, treasurer. Directors, W. E. Hitchcock, J. G. Johnson, A. L. Johnson, T. E. Ross of Muncie, J. F. Merker of Alexandria, Wayne Meeker of Ellwood, S. S. Fisher, S. M. Foster, G. W. Beers of Ft. Wayne.

IOWA.

MARNE—The Marne and Elkhorn Telephone Company has elected the following officers for the ensuing year: Walter E. Potts, president; Alfred Long, vice-president; S. C. Peterson, secretary; Chris. M. Nanson, treasurer. Directors, Walter E. Potts, John T. Frederickson, H. J. Eusden, Alfred Long, S. C. Peterson, C. H. Hanson, Matt Larson.

CRESTON—The Creston Mutual Telephone Company has elected the following officers for the ensuing year: J. C. Sullivan, president; T. K. Wilson, vice-president; John Hackett, treasurer; George Atkinson, secretary.

ALBIA—The Albia Telephone Company has elected the following officers: Grant Hieseman, president and general manager; J. C. Robeson, vice-president; John Rentz, secretary; J. C. Johnson, treasurer.

HARVEY—The Victor Mutual Telephone Company has elected the following officers: V. R. Hanna, president; W. E. Foshier, secretary; R. G. Emmel, treasurer.

NICHOLS—The Nichols Mutual Telephone Company has elected the following officers for the ensuing year: John Nicola, president; R. C. Clerk, vice-president; T. A. Merrill, secretary; Dr. F. F. Carl, treasurer; John Nicola, manager.

NORDNESS—The Nordness Telephone Company has elected officers for the ensuing year as follows: O. O. Loman, president; E. E. Soland, manager. Directors, Ed Lynne, O. O. Rodvang, Julius Brown, C. J. Thorgrinson, N. H. Gjere, J. H. Numedahl.

MINGO—The Mingo Farmers' Mutual Telephone Company has elected officers as follows for the ensuing year: M. F. Blakeley, president; J. Gammon, vice-president; Fred Loerch, secretary; N. A. Ballers, director.

WEST LIBERTY—The South Prairie Mutual Telephone Company has elected directors as follows: J. P. Nichols, J. P. Mountain, A. Anderson, W. J. Barkley, H. L. Metcalf.

GARRISON—The Geneva Mutual Telephone Company has elected A. R. McGirr, president; Curtus Shaw, vice-president; Milo W. Palmer, secretary; S. Allen, treasurer.

FREMONT—The Farmers' and Traders' Telephone Company has elected the following officers for the ensuing year: O. C. Cochran, president; Seth Randall, vice-president; T. O. Stewart, secretary; J. A. Gunn, treasurer.

COBURG—The Coburg and Red Oak Telephone Company has elected officers for the coming year as follows: J. Beeson, president; Frank Rockwell, vice-president; Fred Peterson, secretary.